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A NEW BAND SAWMILL.

The annexed engraving illustrates a new band sawmill patented and manufactured by the Cordesman and Egan Company, of Cincinnati, Ohio.

The cut shows the mill in operation, and the manufacturers claim for it advantages and conveniences not possessed by other saw mills for cutting good lumber from logs 6 feet in diameter and less, and for speed and durability they claim it to be equal to most circular sawmills in use, while the saving of the timber is very much greater. This band sawmill is not an experiment, but, according to the testimonials of a number of large lumber sawing concerns, it produces good work and is satisfactory in its results. Any person who is used to operating a small band saw can with little practice run the band sawmill. We briefly extract from the manufacturers' own description.

The new band sawmill, they state, is designed specially for the cutting of all kinds of lumber, both hard and soft, and the advantages claimed for it are economy in cutting large logs and good lumber, such as wide poplar, walnut, ash, oak, cedar, pine, etc., and for cutting thin lumber for special purposes, say a quarter of an inch, three-eighths of an inch, five-eighths of an inch, three-fourths of an inch, and one inch, it possesses many advantages not obtainable by other machines.

The blade used is about 18 or 19 gauge, so that the kerf taken out is scant one-sixteenth of an inch, so that there is a great saving in material over the production by the ordinary mill with top saw, and the lumber is left much smoother, thus requiring a much lighter cut in dressing.

By reference to the engraving it will be seen that the base is constructed solid and heavy, and carries the main column, the gear and feed shafts, as well also as the lower boxes and shafts.

The column is constructed of tapering shape, and is fitted to the base on a planed surface, which obviates the use of all bracing, even when the wheel revolves at a speed of four hundred or more revolutions a minute. The axes are of 4-inch steel and run in self-oiling boxes. The wheels are 78 inches in diameter and made of glued up hard wood. The feed is a friction disk, and can be changed instantly from 0 to 100 feet lineal per minute, and the return of the carriage may be 300 feet if desired. All adjustment in the machine can be made from the working side, and each complete machine is provided with patent head blocks, carriage and trucks, and rolls, one Perin blade six inches wide, with wrenches, etc.

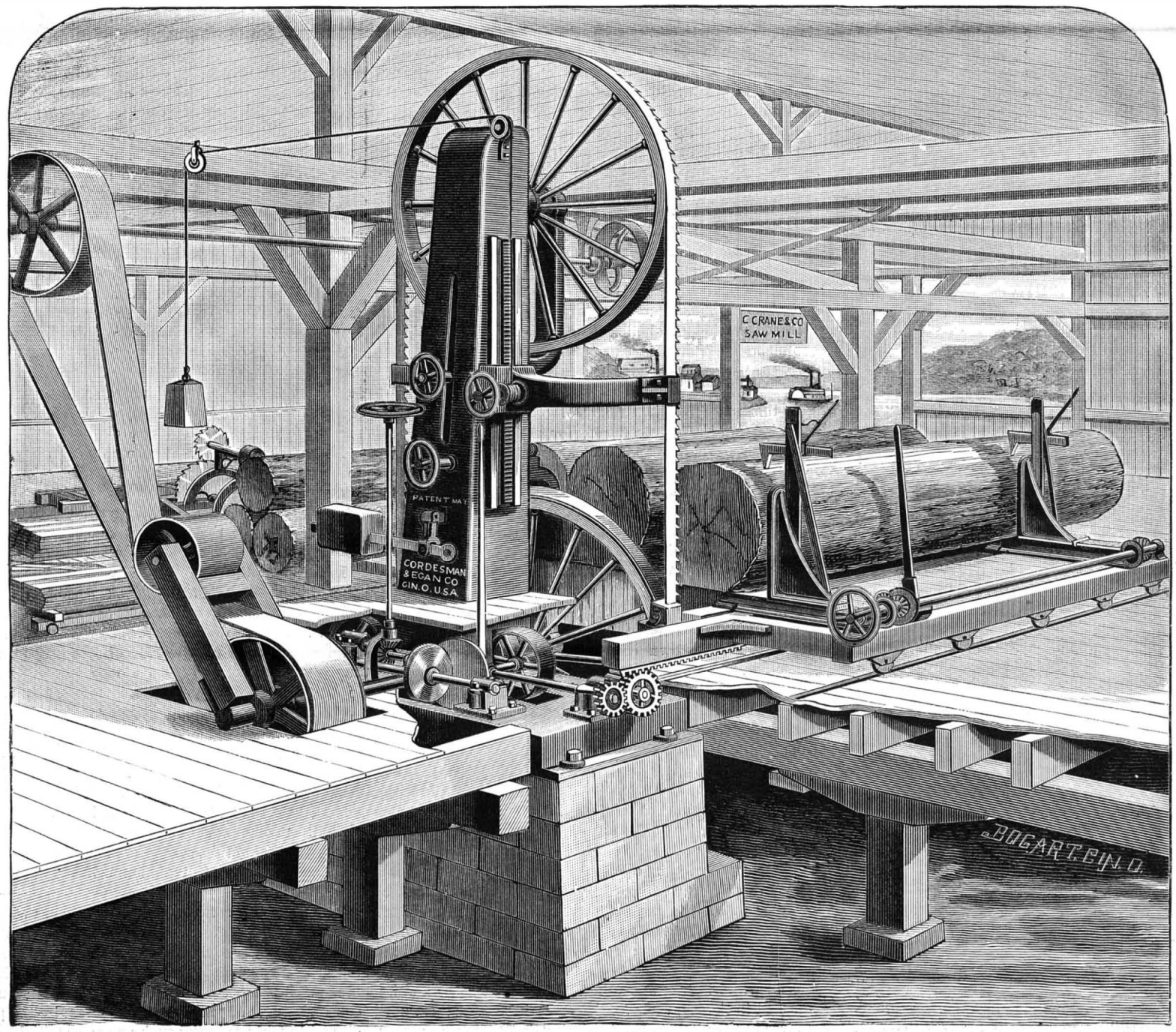
A large number of these band sawmills are in use, and persons desiring to know more of their capabilities for good work can obtain the names of the users or other information by addressing the manufacturers, Cordesman and Egan Company, 209 to 229 West Front Street, Cincinnati, Ohio.

Electrical Storage Batteries.

At the recent meeting of the British Association, in the Mechanical Science Section, Mr. A. Reckenbaum read a paper on "Electric Launches," in which he gave a description of the launch Electricity, which made her first trip in September, 1882. She is 25 feet long, with 5 feet beam, and draws 21 inches forward and 30 inches aft. Her speed is 8·3 miles per hour with ten passengers on board. Forty-five Sellon-Volckmann accumulators supplied the current to two Siemens dynamos. A Collis-Browne propeller of 20 inches diameter and 3 feet pitch was employed. The speed of the screw was reduced to 350 revolutions, while the motors revolved at 950 revolutions per minute. In later experiments the dynamos were replaced by one D_2 Siemens machine, which was directly connected to the screw shaft. More recently Messrs. Yarrow & Co., in conjunction with the Electrical Power Storage Company, fitted up an electrical launch destined for the Vienna Exhibition. The boat was 40 feet long, with 6 feet beam, and could carry forty passengers. The motor was a Siemens machine, which developed seven horse power. During the trial the speed of the boat, which was over eight miles, could be varied by a communicator which threw more or less cells in operation.

Sir W. Siemens said from his knowledge of the behavior of these launches, they promised excellent results. The question was, What was the secondary battery going to do for us? Was it going to last, or was it a perishable institution? In order to test the question quickly, he put down secondary batteries in his own house last autumn. He charged them by means of a very small half horse power engine, and the result so far had been very satisfactory. He had lighted his house by the small engine with the aid of the secondary battery with great effect, using forty incandescent lamps from half past seven in the evening until one or two o'clock. He started his engine at eight o'clock in the morning, and in the evening he had a sufficient accumulation of energy in the battery to last the length of time it was required. In the case of the launch, the machine could not be taken with it, and the battery would occasionally have to be charged. Therefore he would limit the application of the electric power to navigation to short stages. The cost of the use of steam power and electric storage would be about equal; but the latter would give advantages in weight and space.

FRESNO County, Cal., is making a canal 100 feet wide from King's River to irrigate 30,000,000 acres of dry and worthless desert.



A NEW LOG BAND SAWMILL.

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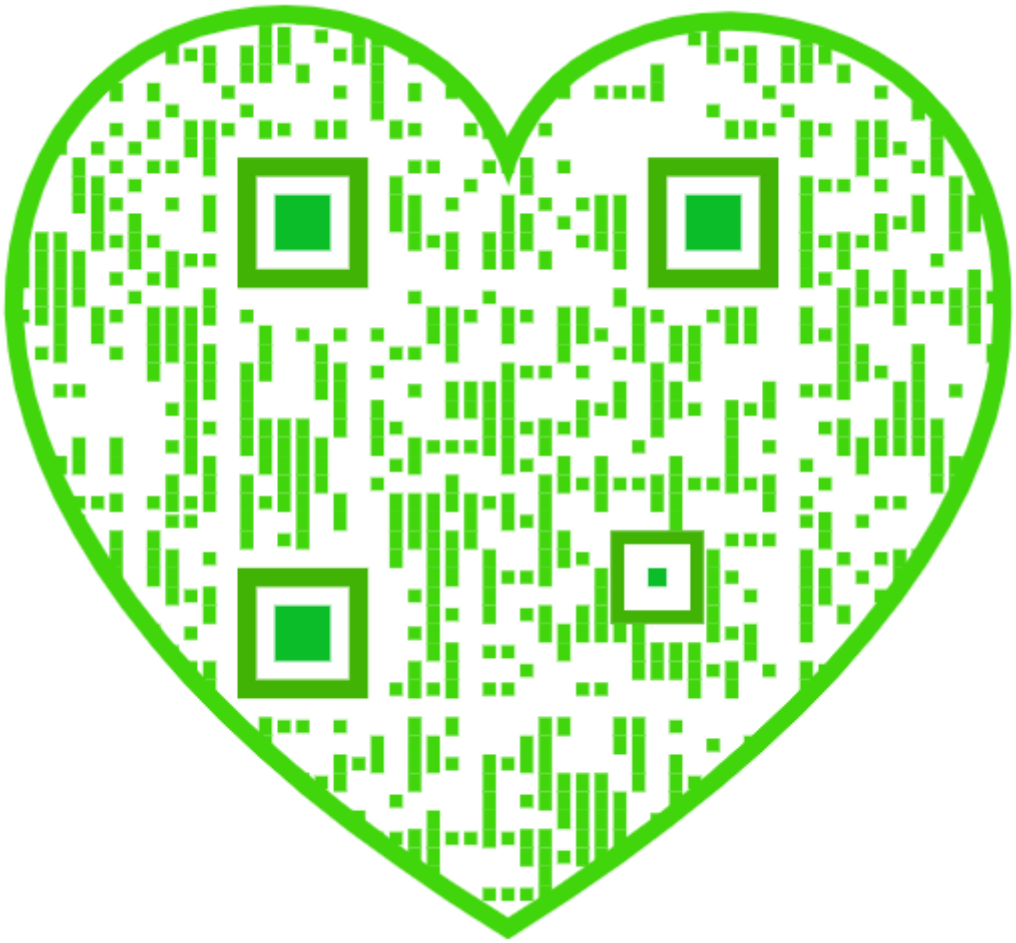

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SUCCESSFUL TREATMENT OF CHOLERA.

The rapidity with which this dread disease accomplishes its work renders any treatment most acceptable which is likely to prove successful, and hence the value of the recent communication of Dr. John Chapman to the *Journal de Medecine*, of Paris. Believing "that the proximate cause of all the phenomena of cholera, before the stage of reaction, is hyperæmia (active sanguineous congestion), with consequent excessive action, of the spinal cord and of the ganglionic or sympathetic nervous system," the characteristic features of the doctor's treatment consisted in the application of heat to the general surface of the body as persistently as possible, and, simultaneously, the application of cold by means of a spinal ice bag along the whole of the spinal column which is coextensive with the spinal cord, and that part *only*, during the presence of vomiting, purging, cramps, or algidity. After the symptoms have been subdued and reaction established, the reaction is controlled, if it becomes necessary, by the application of heat along some part or the whole of the spine.

At Southampton, in 1865, five patients out of seven recovered under this treatment, and of the two fatal cases one was an habitual drunkard and the other a woman aged 73, and who had been living at the starvation point up to the time she was attacked. Each case presented in a decided form the cardinal symptoms of cholera, namely, vomiting, purging, cramps, and excessive cold of the surface of the body.

With this treatment 28 per cent proved fatal, and with the ordinary methods 62 per cent proved fatal. The variations of temperature were from not lower than 32° Fah. to not, necessarily, higher than 120°.

FUSIBLE SAFETY BOILER PLUGS.

These handy contrivances are in use generally, their office being to give notice of lowness of water that may be dangerous. They are usually made of "composition"—brass—quite hard, and have a drilled hole from end to end, the entire length being sufficient to pass through the shell of the boiler and project far enough beyond the inside surface to be above the sediment or scale. The lower end is formed into a bolt head, and the shank is threaded and is screwed into a tapped hole over the fire-box, in the crown sheet. The *Locomotive* sustains the rule of the United States Steamboat Inspection service as to the fusible filling, which shall be of pure Banca tin.

To this filling there may be objections, and possibly objections may be found to *any* fusible composition. It is possible that the experience of engineers, as accumulated, proves that the "life" of easily fusible metals is destroyed under certain circumstances. At all events, it can be readily substantiated by facts that easily fusible plugs have refused to act under the most exacting circumstances after having been in use two years—sometimes less.

There is a remedy in removing and refilling the safety plug once in six months or once a year. But perhaps a better method would be to discard the use of brass—composition—and substitute wrought iron, of a similar character to that of the boiler plate. Tin is the core to be fused. It is surrounded by brass, a compound of which tin is an important component. With the action of heat there may be a chemical action that destroys or impairs the fusibility of the tin; experience seems to point this way.

The recommendation of the *Locomotive* that the core for receiving the fusible filling should be tapered from the inside of the boiler to the outside of the plug, the larger diameter being inside the boiler, is a reasonable one, and will commend itself to engineers.

PREPARING FOR THE ICE CROP.

At this time of the year many of our farmers turn their attention to making preparations for gathering their annual crop of ice. The plans for building ice houses differ widely in the various sections of the country, and in many instances are controlled by the wants and financial ability of the builder. The double walled, with the space filled with sand or sawdust; the solid thick wall of brick or masonry; the two walls, each only a single brick thick, with an intervening air space; those on the surface, those half below, and those completely buried with the exception of the roof—all these and many more find strong advocates. In most of the cases the houses are erected by one who follows his own free will, aiming to suit his own convenience, taste, and ideas of architecture.

But it would be well to pay more attention to the pond or lake from which the ice is to be taken than is generally done. The fact that water will not, by freezing, free itself from impurities which endanger health is being widely recognized, and a close examination of the pond itself and of the land that drains into it will certainly result in much benefit and may prevent disease. If the ice is to be taken from still water, the decaying vegetable matter at the bottom should be removed, especially from under the part to be cut; and if the water has a current it should be removed for a considerable distance above, so that the gases will not be carried down to the place of cutting. The gases resulting from decomposition partly escape, but much remains and is liable to rise at any time; besides, the chemical action is not wholly stopped by the cold, but continues to a certain extent all winter. The ascending bubbles are caught and imprisoned in the ice, their foulness remaining with them until set free in the pitcher of water during the following summer. Well authenticated cases of sickness have been caused by ice water, the ice having been taken from ponds where incoming water flowed over beds of decaying sawdust.

That the drainage from barnyards is likely to prove harmful is self-apparent, and it is hardly necessary to state that it should be kept out of the ice pond, yet there are many barns located directly on the bank, near the very edge. Because in times past the gantlet has been successfully run is a poor excuse for still inviting the danger. The washing from a pigsty is undoubtedly the worst of the kind, and it should never be so situated that any part of its filth can by any possible path find its way into a body of water used for drinking purposes during either the summer or winter. The habit of placing vaults on the banks of a small stream cannot be too strongly condemned, and although they may be below the spot from which water or ice is taken, and so save the owner, they menace his neighbor, who may be many miles down stream. If quite near the pond the land upon which they are built should be examined, lest the contents find entrance through the soil. The germs of disease are liable to be transmitted from them.

It is always a safe rule to discard ice from water that cattle refuse to drink. But this test is by no means sufficient, as the clearest and most sparkling water may have an enemy to health lurking within it. What is better is a critical examination of all possible sources of contamination and the effectual barring out of those likely to prove objectionable. This search should not only cover the immediate vicinity of the pond, but should extend for some distance up each stream emptying into it.

WAGES IN FRANCE AND GERMANY.

An article furnishing some valuable information about the wages paid in the different trades in Paris recently appeared in the *Revue des Deux Mondes*. In that gay capital, strikes are the luxury of well paid workmen, as this means of improving their condition is distrusted by those who live from hand to mouth. Apprentices in the jewelry and silversmith trade, as soon as they begin to work on their own account, receive 4s. a day; experienced workmen from 12s. to 24s. per day. Type setters get from 6s. to 12s. per day, and pressmen generally something short of this. Wood engravers vary from 6s. to 12s., but those who rank as artists earn from 12s. to 24s. In the building trade there is, practically, an average price paid by all contractors.

The city is the great employer of skilled labor of this kind, and pays stonecutters 10s. for 12 hours' work in summer, and 8s. for 8 hours' work in winter. Masons receive 6s. in summer and 5s. in winter. Carpenters get 7s. in summer and 5s. in winter; and tinsmiths, marble masons, painters, and glaziers about the same, with higher rates for those engaged in artistic branches, such as fresco and other decorations. Wages have advanced from 25 to 60 per cent., owing to the good example set by the city. Wood carvers get from 10s. to 12s. per day, upholsterers the same, and German and Italian workmen on interior decoration from 2s. 6d. to 4s. Machinists earn from 4s. up, according to employment and ability. The ordinary day laborer, in all trades, gets from 2s. 6d. to 4s. a day, and foreigners who arrive by shoals manage to save something to take home.

The number of regular workmen in Paris is estimated at 200,000, those living by occasional jobs number 75,000, and the beggars and vagabonds 15,000. It is estimated that 74 per cent. of the working population earn 4s. per day, 22 per cent. earn from 3s. to 4s., while 4 per cent earn less than 3s. So prevalent are strikes in Paris that there are, on the lists of those receiving charity, five times as many mechanics of the best paying trades than those who receive the least remuneration. In the same trades women receive from 20 to 40 per cent. less than men, and in flower making, embroidering, dress-making, and the like, there is a dull season to tide over, for which they must save enough.

Many industries pay women only 2s. a day, due largely to competition in all kinds of sewing in prisons, convents, and charities. There are nearly twice as many women registered as recipients of charity as men, the total being upward of 40,000 women, of whom 5,000 are day workers, 2,298 servants, 1,500 sewing women, 1,200 dressmakers.

In Germany the average weekly wages, the working day being 12 hours all through the week, paid to Berlin stonemasons vary from 15 to 28 marks (a mark is about 25 cents of our money); to turners about 20 marks; gold and silver artificers, according to the class of work upon which they are employed, from 12 to 30 marks; beltmakers, workmen in foundries, 12 to 18 marks; locksmiths, 15 marks; smiths, 15 to 24 marks; workmen in machine factories, from 17 to 31 marks; watchmakers and soapmakers, 18 marks; tanners, 15 to 18 marks, linen and calico weavers from 7 to 18 marks; cloth weavers from 10 to 20 marks; carpetmakers, 15 marks; joiners and kindred trades, 15 marks; butchers, 12 to 20 marks; brewers, 21 to 31 marks; tailors, 6 to 15 marks; female dressmakers, 7 to 12 marks; shoemakers, 12 marks. The wages in South Germany are about the same as those in Berlin, but the cost of living is much less.

THE Memphis cotton seed mills, which, owing to a lack of the seed, are operated only four or five months annually, are to be consolidated. As it is, they are unable to pay cotton growers enough to induce them to ship the seed, and much of it is consequently used for fertilizing purposes. By consolidating, the mill owners hope to raise the price of the oil and to pay producers such prices as will keep the mills supplied.

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PETROLEUM GEOLOGICALLY CONSIDERED.

It is impossible to trace the geological relations of petroleum, so as to show with what rocks it is liable to be associated, where we might find it, and where we may surely find it; it is not limited to any particular formation or age. It is found in almost every possible series of strata, from the lowest Silurian rocks up to the Tertiary and even Post-Tertiary formations. There are certain points in regard to the manner in which it lies in the rocks and is obtained from them that are full of interest. These, perhaps, cannot be traced out to better advantage than by selecting one single region and studying the petroleum as it exists there. The "oil belt," as it is called, from which the main supply of the world is now derived, is a good example. This has many peculiar features belonging only to itself, but it may be assumed to be fairly representative, so far as history and formation are concerned.

The oil belt lies entirely west of the Alleghanies, extending from Canada to Virginia, with a width of 70 miles and upward, but the part from which, practically, the entire product is derived is much smaller, being within the State of Pennsylvania and covering in round numbers 3,200 square miles, though in actual fact only 39½ square miles of even this limited space have really yielded oil in paying quantities. This is, properly, the "oil center." Throughout its extent the oil wells are gathered in groups, and this grouping is indicative of the relation between the rock oil and the rocks.

An oil well is simply a hole drilled down so that it may serve as a discharge pipe for a fluid that exists at a greater or less depth below the surface of the earth, and is held there as if in a reservoir under pressure. As the drill passes down, the "first sand rock" is struck and passed; nothing is found in it; further down comes the "second sand rock," like the first; further still, the drill strikes the "third sand rock," which is truly the oil-bearing stratum, that is, if the well "strikes oil," for a large proportion of the wells sunk are "dry holes." When the drill breaks through the oil-saturated sponge, as the sand rock may be called, the manifestations are sometimes wonderful. The fluid which permeates the rock is, of course, in intercommunication throughout its entire extent, and is always under more or less pressure. The mighty strain that the internal forces exert is graphically illustrated when a "spouting well" is struck.

Now the curious feature of this sand rock is that it is not of uniform thickness, neither does it lie horizontal. Each individual mass or bed is found to be irregularly circular in form, saucer shaped, and thickest in the middle. Within every part of this space oil may be found; outside of it there is none until a similar bed is found. Judging from the quantity of oil which flows and continues to flow from a given well or group of wells, it seems nearly certain that the source is not in the vicinity of the place from whence it is drawn; that these disks of sand rock merely indicate a region which, from its structure, serves as a sort of "chimney," through which the supply from beneath presses upward the pipe serving as a vent. This view of the distance of the source is of great interest and importance. If the supply lies near the surface only, at the level where we tap it, it does seem possible, and in fact probable, that the enormous output of the present day must produce exhaustion, and at no very distant date. But if the true source is in the profound depths of the earth, we need have no fear of reaching a limit.

The nature of petroleum may aid in forming some idea of its origin and the prospects of its continuance. Being a hydrocarbon intimately allied in chemical composition to coal, especially bituminous, it was entirely natural, from the first, to infer that the two had a similar origin, and this opinion is still maintained by many. As to the origin of coal, there can be no doubt; it was produced by the transformation of vegetable material, through the action of certain agencies of long duration, prominent among which have been heat and pressure. The rock strata in which these vegetable masses were deposited previous to transformation are almost universally concave, and we call them "coal basins," recalling to mind the disks of sandstone in which we find petroleum. The vegetable origin thus indicated necessarily demands for coal an abundant development of life, and no coal has been found in the rocks which are termed azoic.

In this respect it differs from petroleum, though both of them occur in strata of various ages in the later formations. It is very seldom, however, that they are found in juxtaposition. A petroleum spring is not a guide to a coal vein, and though they are so similar in chemical composition no other feature seems manifest which should lead us to infer that petroleum and coal have in any way a common origin. And though coal demonstrates the antecedent occurrence of life, we cannot say the same thing of petroleum. We know that, at the present time, the substances we call organic are composed mainly of carbon, nitrogen, oxygen and hydrogen. Petroleum is a hydrocarbon, but shows no signs of organic origin. The microscope shows no cells or fibers in it, as in coal. To say the least, it is entirely possible that it is of inorganic origin. The antecedent presence of life is not at all essential to effect a chemical union which will give us a hydrocarbon in either gaseous, liquid, or solid form.

No one probably thinks of demanding an organic origin for carbureted hydrogen, which issues from some of the borings in the oil regions, and there are reasons for believing that the same forces produced the two combinations. Wherever water exists, either as a liquid or as solidified by combination, we find hydrogen in abundance, and in the carbonates we find the supply of carbon, and the structure of the lowest rocks of which we have any knowledge shows plainly that when solid materials began to have place, carbon and hydrogen existed gaseously and separately. There is nothing to hinder their existing thus now; or if not thus uncombined at the present time, what is to hinder their being set at liberty from other unions by the forces of their environment, and, thus prepared, to form hydrocarbons when presented to each other? And if thus set free and thus uniting, it is entirely within the range of natural forces that they should form, and perhaps at the same place, the two which we find in juxtaposition—the gas and the liquid. It is true that, according to our ideas of chemistry, we rank these two hydrocarbons in different series; but that proves nothing except our inability to match the workings of the great laboratory in our small establishments. Recent researches have shown us that even we can begin to step from the one series into the other, and that the great internal forces should do it readily and constantly is certainly quite possible. If the supply of petroleum lies only at a small depth, there is little use in searching for a means of using it. But it is altogether probable that we must look deeper for its source, and as it is, perhaps, totally of inorganic origin, we may look to find the supply persistent.

A.

TONKIN.

The recent efforts in Asia of the French to obtain complete possession of Tonkin have attracted to that region some attention, and an account of its features and productions seems needed.

Tonkin is bounded on the north by the Chinese provinces of Kouang-Tong, Kouang-Si, and Yunnan; on the south by Cochin China; east by the Gulf of Tonkin; and on the west by a chain of mountains which separate it from the basin of the Me-kong, and the small States of Laos, which are tributary to the realm of Siam.

Tonkin forms with Cochin China the realm of Annam, which has Hué for its capital. Tonkin itself embraces 150,000 square kilometers (93,000 square miles), or more than one-quarter of France.

Its principal rivers are the Rouge, Claire, Noire, Thai-Bink, Song-Ma, Song-Mo, Song-Giauk. The most of these rivers have slow currents, and are easily ascended. The rainy season is from April to September; the temperature then does not exceed 35° Cent., and sinks to 16° Cent. During the dry season, from September to the end of March, the temperature falls from 15° Cent. to 7° Cent. above zero. The population is confined to the plains. Here are towns with 150,000 inhabitants, and others with 40,000 and decreasing numbers. The north and west of Tonkin is very mountainous. These mountains are covered with magnificent trees, and could be easily cultivated. They are occupied by Laotian races, who live upon them with few cares, and unsubjugated by the Annamite mandarins.

The principal river, the Red, forms at about 130,000 meters (100 miles) from its mouth an immense delta of alluvium of extreme fertility.

This delta is thickly populated. Rice is raised in abundance; two crops are harvested yearly. Maize is only cultivated in a few localities unfavorable for the production of rice. In the dry and sandy regions the Tonkins cultivate the *igname*, sweet potatoes, marsh roots, etc. Sugar cane is largely grown, and under skillful cultivation would yield enormous quantities of sugar. Unoccupied lands, which have never been planted and are gardens of fertility, would produce an immense amount of this necessary, and the rivers and streams afford on every hand water power and easy transportation.

The hill slopes bordering the Red River have been planted with coffee trees, and good results have been attained. The cheapness of labor and the abundance of land favor this enterprise.

Tonkin produces cotton, and of a fine quality. The fertile alluvial plains afford it a similar habitat to that which it enjoys in Louisiana and the Carolinas. Tea and tobacco find in Tonkin a very favorable home. Cinnamon is one of the principal products, and affords a large revenue. It is harvested upon the mountains of one district. The King of Annam monopolizes the best qualities. Among medicinal productions the most remarkable is the *Hoang-Nan*, a strychnine which grows in the mountains of *Bo-Chinh* and of *Nighe-An*. It appears to cure madness, paralysis, leprosy, the bites of snakes, and in general all forms of virus. Indigo, oils of various sorts, resins, gutta-percha, varnishes equal to the lacquer of the Chinese or of Japan, essences, perfumes, are all found in this rich country. Among precious woods the *calambac* is remarkable. It is a most odoriferous tree, and when buried a meter and a half (about five feet) under the surface of the ground its odor reaches the air above. Here grow rosewood, ebony, sapan, and sandalwood.

In Tonkin there are numerous gold mines, and even the streams carry down the mountain sides flakes of gold. There are cantons where ducks are raised for the purpose of gathering the gold from their excrements. In the mountains of high Tonkin, in the basin of the Red River and its tributary the Black River, the precious metal is found in large amounts, and in many other districts the clearest indications of its presence are shown.

Tonkin is equally rich in silver, of which however less is known. Copper is found in quantities which exceed those furnished by Chili and other American sources. Kettles, wash basins, coffee pots, spittoons, are all made of copper.

Tonkin also possesses tin mines. The principal localities around Lao-Kai have not been explored, from need of capital, but those in the province of Yunnan are said to be the most important known. Here over 10,000 people find employment. But these valuable products do not complete the list of its mineral wealth. Mercury, zinc, argentiferous galena, bismuth, antimony, iron, and precious stones, besides the great deposits of coal, must be added to the dazzling list of its possessions.

There are but few horses; they are of a good stock, small but vigorous. The cattle are small but well made; they belong to the genus zebu, with a pad of flesh upon the neck at the head of the mane. The flesh is excellent eating. Pork is the staple article of diet; not a family can be found without its pigs. The flesh is flat. There are no sheep, but numerous goats.

Ducks, geese, chickens, and pigeons abound and sell at low prices. In the mountains and forests there are hidden tigers, panthers, bears, rhinoceri, and the elephant. The musk kid lives in the mountains, and here are encountered the deer, fawn, and roe buck, while on the plains the rabbit and partridges multiply.

There are many beautiful birds, whose plumage is a prize to the hat makers. Since the first year of Tonkin's commercial freedom, 15,000 to 20,000 skins of birds have been exported, the most of them to France. On the coasts are gathered tortoise shell and pearl.

The silk worm flourishes here, but the Tonkinese do not understand the unwinding of the cocoons, and their products are imperfect and inferior. No country unites perhaps in so marked a degree as Tonkin all these various riches. Add to that a healthy climate, a docile population, and it forms the most attractive colonial station in the world.—*M. Millot, in Revue Scientifique.*

Werdermann.

It is with extreme regret we announce the decease, on September 15, of the well known electrical engineer, Mr. R. Werdermann, at the comparatively early age of 55 years. The deceased gentleman had been resident in London since the year 1870, when he brought over from Paris and introduced into England the "Gramme" dynamo electric machine. Notwithstanding his long connection with the invention of M. Gramme, and the enthusiastic manner in which he championed this most successful machine of modern times, we understand that he sustained heavy losses in his business associations therewith. The recent decision of Judge Blatchford, in America, declaring the Gramme patent void, was, we believe, a most serious and heavy blow to him, as we are informed that he owned the American patent. In 1878 Mr. Werdermann's name was most prominently brought forward in connection with his so-called *semi*-incandescent electric light. We published at the time full particulars of his lamp, which doubtless gave a great impetus to electric lighting in England, and which has since been successfully imitated by other electricians.

The subjects we have mentioned are those by which Mr. Werdermann is best known, but the records of the Patent Office show very forcibly his great energy in other directions. For the past two or three years he had busied himself in perfecting a new dynamo and an incandescent lamp, referred to at various times in our columns. He was an eminently practical electrician, and his knowledge of many other branches of science was very considerable. It was our lot to be in almost daily communication with Mr. Werdermann for some years, and to assist in the numberless experiments which he made with dynamos of various constructions, arc lamps and electric candles, electro plating, the transmission of power by electricity, which is now attracting so much attention at home and abroad, electrical railways, and many other minor matters in which electricity played the leading part.

The results of these experiments will probably never be known to the world, but from our own experience we can truly say that many things which are now in successful operation were fully worked out by Mr. Werdermann in the early days of dynamos. His inventive mind led him to attempt too many things, the result being that before one subject had been fairly started toward a successful career it was abandoned for another. Like many others who have labored toward the advancement of science, it is to be feared that he has left his family, consisting of the widow, a son, and three daughters, without any provision for the future. Space will not permit us to dwell upon the many admirable personal qualities possessed by Mr. Werdermann. An affectionate father, and a stanch friend to those who possessed his confidence, he will be kindly remembered by those who gained his esteem.

We look back with satisfaction that in former days we were enabled to render him such assistance as lay in our power, but it is much to be regretted that his long and laborious toiling has been so ill rewarded.—*Electrical Review.*

THE Swedish and Danish Governments have decided to lay down a new submarine cable between the two countries. The cable, which will consist of four wires, will be laid from Helsingborg to Elsinore via the island of Hveen.

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Irrigation on a Large Scale.

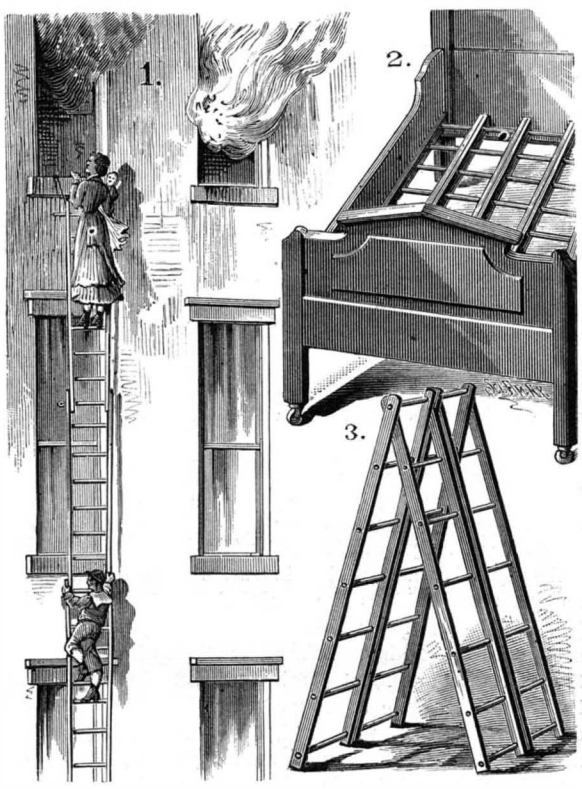
The most gigantic irrigation enterprise ever inaugurated in the State of California has been commenced in Fresno County, the canal for which will be the largest in the State, and fed by King's River. The water is intended to irrigate 30,000,000 acres of rich land, at present barren through lack of water. The source of supply of this canal will be higher than any other debouching from the same stream. Its dimensions are: One hundred feet in width at the bottom; levees an average of fifteen feet in height and eight feet wide at the top, broad enough for a wagon road. The depth of the water is expected to be five feet, with a fall of eighteen inches to the mile. The dam in the mountain cañon, whence the water is taken, will be a wonderful and permanent one. It is twenty-five feet high, eight hundred feet long, one hundred and forty feet wide at the base and twenty-five feet wide on top. It is rip-rapped on the inside with heavy rock, and every precaution taken to make it sufficiently strong to securely hold the great weight of water that must be supported. The water is led into the canal from a large headgate, constructed of heavy timber, one hundred feet in width and eighteen feet high. It is planked over so as to make a bridge for heavy wagons, and has wings to protect it from the floods. The canal is expected to carry thirteen hundred cubic feet of water per second.—*Los Angeles Herald.*

Railroads in Venezuela.

The first railroad built and operated in Venezuela began at Puerto Cabello and led to the westward. About ten miles were built and operated, but embarrassment followed, and nothing is now to be seen except a dim outline of the road bed. About the year 1870 an English company built a 2-foot gauge road from Tucacas to the mines of Aroa, a distance of 55½ miles. Poisonous reptiles, wild animals, malaria, and dense jungles combined to obstruct the building of the road. The largest bridge has a span of 90 feet. The ties, bridges, and even the telegraph poles are of iron. The road for its last five miles has a grade of 600 feet, requiring specially constructed engines. The freight cars carry from five to six tons and the passenger cars about 30 passengers. A road from La Guira to Caracas, a distance of 22 miles, has been in process of construction for several years. The track of the road is 3½ foot gauge. It is built on a series of reverse curves having a radius of 140 feet. Surveys have been made for other lines, and a small amount of grading has been done on a road 40 miles long from Puerto Cabello to Valencia.

BED BOTTOM FIRE ESCAPE.

The fire escape herewith illustrated consists of ladders which may be disposed so as to take the place of the slats in an ordinary bedstead, as shown in Fig. 2, or joined end to end and suspended from the window of a building, as in Fig. 1, or arranged as a step-ladder, as in Fig. 3. The ladders are made of white ash or other suitable wood from one inch boards; the side bars are 1 by 2 inches, and the rods are three-fourths inch thick, well secured. For general use the sections would be 6 feet long, and would be made tapering from 10 inches wide on one end to 12 inches on the other



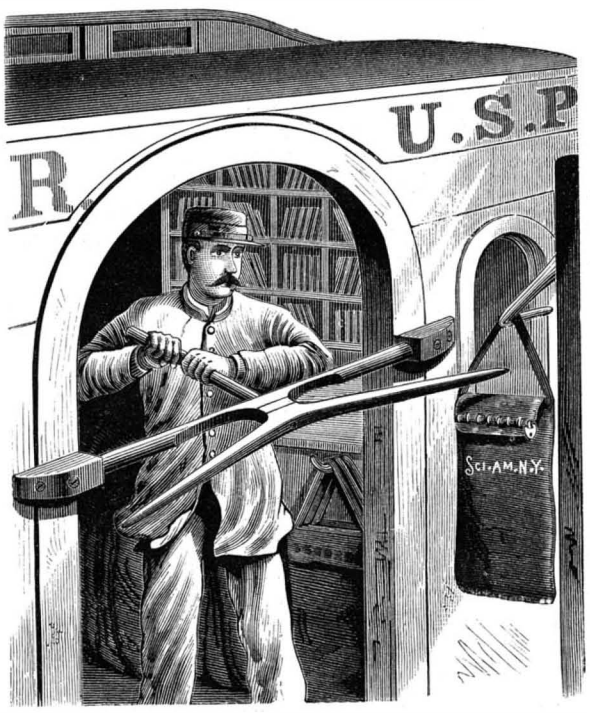
BLOEDON'S BED BOTTOM FIRE ESCAPE.

By this means the ends of the sections may be lapped and secured by rods and pins so as to form one long ladder. Holes are made in the ends for the connecting rod to pass through. Through holes in one end of one section is passed a rope fastened to a board of a length just sufficient to rest across an ordinary bed. This board is placed across the window, and makes a secure hold for the ladder when used as a fire escape. The parts are, practically, laid away when not needed, and yet may be easily and rapidly connected and hung from the window if circumstances so require.

This invention has been patented by Mr. Louis Bloedon, of Bay City, Mich.

MAIL BAG CATCHER.

This invention provides a simple, efficient, and cheap device which can be attached to a mail car for catching the mail bags hung from a crane at the side of the track, while the car is in motion. Across the door of the car horizontally extends a bar, each end of which is journaled in bearings fixed to the side of the car. The arm which catches the bags is heaviest at its center, and the two branches taper toward the ends and are slightly bent at the middle. This arm is attached to the cross bar by a tenon, and between the arm and bar is a shoulder, which may be a separate piece or which may be made as a part of either. The crossbar is



KELLOGG'S MAIL BAG CATCHER.

recessed at each side of the center in order to more securely grasp the mail bag after it has been caught from the crane. This method of construction, together with the shoulder, will facilitate the removal of the bag from the catcher by the mail agents. Projecting from the opposite side of the cross bar is a handle by which the bar can be swung axially. The arm being double, either end may be brought into position for catching the bag, irrespective of the direction in which the car is moving, or the speed. When not in use the catcher gravitates, by the weight of the arm, to an upright position, in which it is out of the way.

This invention has been patented by Mr. Joseph A. Kellogg, of Nashville, Tenn.

Brazilian Woods.

M. Thanneur, a correspondent of *Les Annales*, describes some of the timber to be found in abundance in the valley of the La Plata and vicinity, and claims high value for them for mechanical and engineering purposes. He says the "quebracho" is perhaps the most interesting of all and the most used. It is very abundant in Brazil and La Plata. Its diameter varies within the same limits as that of the oak, but the trunk is shorter. It is used for railway sleepers, telegraphic poles, piles, etc. It is very durable, especially when well seasoned. It is much heavier than water, its specific gravity varying between 1·203 and 1·333. Its color is reddish, like mahogany, but it becomes darker in time. On account of its hardness it is difficult to work, and it cannot be readily cut with an ax. It has been introduced into France on account of its richness in tannin. A large proportion of Brazilian leather is tanned by the sawdust of quebracho, but the leather is rather brittle. A mixture composed of one-third of powdered quebracho and two-thirds of ordinary tan gives very good results.

Another Balloon Experiment.

The St. Louis *Globe-Democrat* has the following item respecting M. Gentil, the inventor of the balloon, of which our Western contemporaries have lately had considerable to say: M. Gentil was a medical practitioner in France, but owing to political reasons he came to America in 1862, and settled in St. Louis as a locksmith. It has been his life dream to make an air ship, and he has constructed four different machines, each susceptible of improvement. The final effort is a cigar shaped balloon, with gas compartments, a rudder at the thick end, and screw shaped sails at each side to raise or lower the altitude. He claims that he can steer his air ship at will, work his pinions, and raise her when the lifting power of the gas is exhausted. The whole is inclosed in a network, from which depends the car supported by a series of guys, ropes, stays, and gaskets, having the look and gearing of the main deck and bulwarks of a full rigged ship. The model is suspended from the ceiling of his little shop in St. Louis, and is his idol. "It is for the scientific public," M. Gentil said, "the work of my life; and shall I, then, prostitute my grand work by putting it upon exhibition at ten cents a head, like a stuffed whale or petrified hog? I want no money. I give it to the people, and I am happy."

A Remarkable Ice Well.

Mr. Levi Allen, of Horse Plains, Montana, writes as follows: I have a well forty-five feet deep, situated under sawmill. In sinking the well, at a depth of thirty-five feet we encountered a strong current of air, strong enough to blow out a candle. Last September the well commenced to freeze up; we banked it with sawdust, but it did no good. The last of November it was frozen solid. I have a steam pump within fifteen feet of bottom of the well; went down last week to the pump to repair same, and found two feet of solid ice within four feet of the pump. The mill has been idle for three months. This well is dug through solid gravel, is situated on low ground, seems to have been the bed of the Pend d'Oreille River. The river is distant three-quarters of a mile.

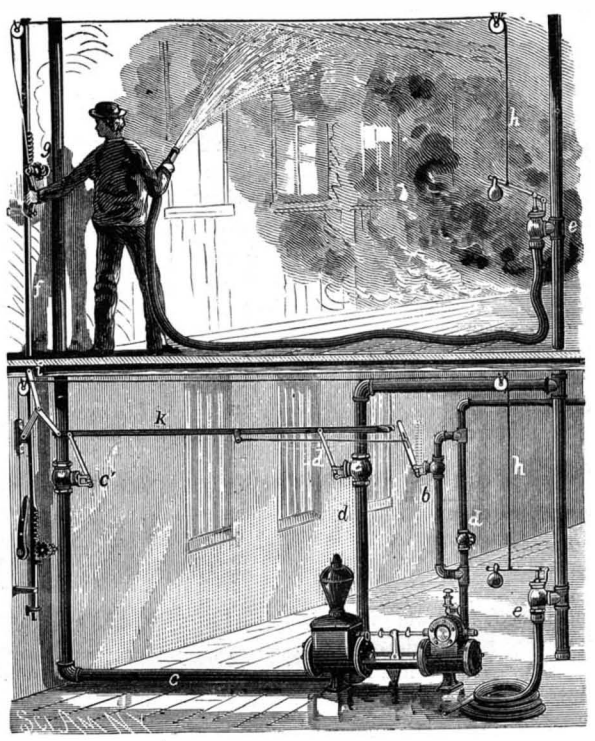
Can you explain the cause of the freezing of the water in this well?

FIRE EXTINGUISHING APPARATUS.

By means of this invention the extinguishing of fires in buildings is greatly facilitated, as on each floor there is a lever controlling the admission of steam to the steam pump, and the same motion opens the valve admitting water. Almost instantly the pump is set in operation, and a bountiful supply of water is received at the point where the fire is discovered. On the lower floor, or in the basement, is an ordinary steam pump receiving steam through a pipe from a boiler, not shown in the engraving. This pipe is provided with a valve placed near the engine, and also with a branch pipe, *b*, the ends of which are connected with the pipe, upon opposite sides of the valve, and by means of the valve in the branch steam can be admitted to the engine independently of the first mentioned valve. The inlet or suction pipe of the pump connects with a well or other suitable water supply.

The discharge pipe of the pump is shown at *c*, leading to a tank in the upper part of the building, and to this is connected a pipe, *d*, leading through the various stories of the building. These pipes are provided with valves, *c'* and *d'*, so that the water may be directed through either, as may be desired. Upon each story the pipe, *d*, is provided with a discharge cock, *e e*, to which is attached a hose. A bar, *f*, extends through the various stories, sliding vertically in guides attached to the wall, and has formed upon it a section of rack teeth, *g*, into which meshes a small gear wheel. One of the journals of the gear wheel projects and is provided with a tongue to fit in a grooved hole in the end of a lever, so that the bar, *f*, can be raised or lowered by operating the lever. To each lever is attached a cord, *h*, which passes over guide pulleys, and the other end of each cord is attached to a lever connected with the valve stem of the cock, *e*. To the valve lever is hung a weight sufficient to close the cock when the cord is slackened.

To the lower part of the bar, *f*, is hinged the upper end of a short bar, *i*, the lower end of which is hinged to the adjacent ends of two short bars, one end of one being hinged to the wall of the building and the end of the other being joined to the bar, *k*. The movement of the bar, *k*, operates the valves, *c'*, *d'*, and *b*. as shown in the engraving When



MOLENDO'S FIRE EXTINGUISHING APPARATUS.

the rack bar, *f*, is raised by the movement of a lever in opening a valve, as *e*, admitting water, it draws the bar, *k*, outward, thus closing the valve, *c'*, in the water pipe leading to the tank, opening the valve, *d'*, in the pipe leading through the building, and opening the valve, *b*, admitting steam to the engine. When the bar is lowered, the reverse takes place. To make the plan operative when steam cannot be furnished to the engine, the tank at the top of the building is provided, so that there may be a pressure of water constantly on hand.

This invention has been patented by Mr. Hermann Molendo, of 210 E. Ninety-third Street, New York city, who should be addressed for further information.

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Picture Frames from Carton Pierre.

Prof. Meidinger gives the following description of a new method employed in the manufacture of gilded and bronzed picture frames. The composition employed consists of glue, chalk, linseed oil, and paper pulp. The glue is first dissolved and boiled, then silk tissue paper (such as comes between gold leaf is very excellent) is stirred in and rapidly disintegrated, then linseed oil is added, and finally chalk. While hot the mass forms a stiff dough, which is hard when cold, but softens between the fingers, and can be kneaded and pressed into moulds. In a few days it gets dry and is then almost as hard as stone. The paper imparts tenacity to it, so that it is less affected by blows than wood is. Separate pieces of this mass unite readily, and it is easily attached to wood. The proportions of the four constituents are not stated, except that the proper proportions are recognizable by the feeling; in summer more glue is added than in winter, as it readily decomposes (spoils). Owing to the glue, of course, it will not stand the wet, and could not be employed for articles exposed to the weather.

When hard the surface can be shaved off with iron, then polished with sand paper, and is finally coated with a size called "Poliment." This, says Meidinger, is a commercial substance consisting essentially of clay, with the addition of soap and fatty substances. For gilding it is used just as it comes, but for bronzing, only blue or gray shades are used, and some dark pigment must be added, either fine black or umber. The dry pigment would make it too dry, and hence it must be softened by mixing it with melted wax and rubbing it up fine on a stone when cold. One-third of this is mixed with the commercial gray or blue poliment. To make it adhere to the ground, liquid glue must be added. Three or four coats are applied until it is sufficiently covered.

For gilding it is painted over with dilute alcohol and the gold leaf immediately laid on and pressed down. For bronzing a brush is wet with dilute spirits and dipped in the bronze powder, which is applied nearly dry on the poliment. It dries quickly and can be polished at once with agate polishers. The gilding is done as soon as it is polished, but bronzing requires varnishing, so as to impart to it a uniform luster, especially in deep cavities that cannot be polished well, and also to protect the bronze from change of color caused by atmospheric influences. The difference between gilding and bronzing consists, first, in using a darker poliment, as it shows through the bronze, while it is completely hidden by the gold leaf; secondly, in applying the bronze avoiding too damp a brush and too strong alcohol; thirdly, in the final coating with varnish.

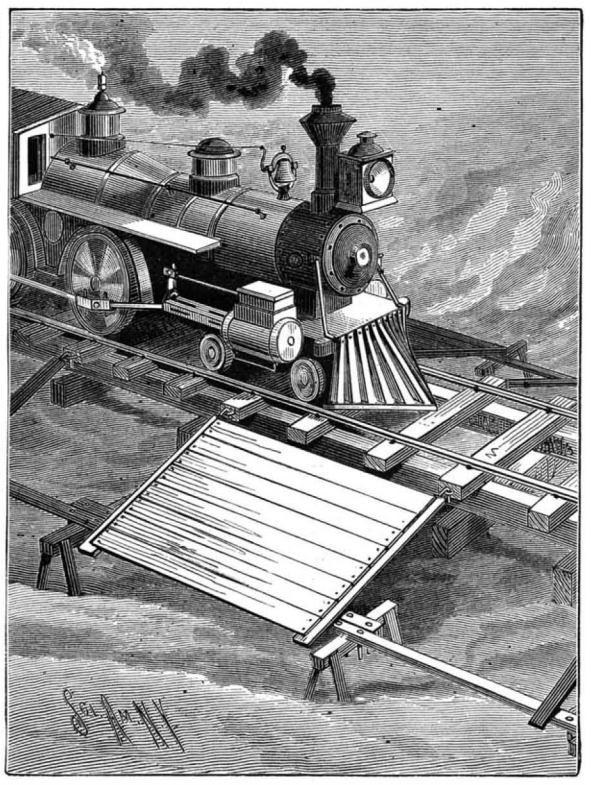
NEW TURRET SHIP CONQUEROR.

This ship, now fitting out in Chatham Dockyard, will be, when completed, one of the most formidable vessels in the British Navy. Her armament consists of two of the new 43-ton breech-loading guns, in a turret protected by 12 inches of compound steel-faced armor, four 6-inch breech-loaders, two of which are placed in recessed ports aft, and two on Vavasour carriages, behind shields, amidships on the upper deck. She also carries, says the *Graphic*, to which we are indebted for our engraving, seven Nordenfelds, and two Gardner guns aloft in the top, or "upper fortress." Six torpedo ports, three on either side, from which Whitehead torpedoes can be discharged, and a most powerful ram complete her means of offense. Her engines are by Messrs. Humphreys & Tennant, and a full boiler power propel the ship at a speed of 15·5 knots.

THE returns of the census taken on January 1, 1883, which have just been published, show that the Empire of Japan contained a population of 36,700,100, made up of 18,598,998 males and 18,121,000 females.

IMPROVED SAND GUARD FOR RAILWAYS.

The guard prevents sand which is carried along by the wind from accumulating on the tracks. It consists in a series of boards pivoted at the sides of the track and supporting other boards, under which the wind passes, sweeping over the track and carrying the sand along with it. The rails are spiked to ties, placed the usual distance apart, which rest on longitudinal beams supported on sleepers that



IMPROVED SAND GUARD FOR RAILWAYS.

are embedded in the ground, which must consist of gravel or some other earth that cannot be blown away. At the ends of some of the ties are loops for receiving hooks on the ends of boards, whose free ends rest on rails placed at the side of the track and parallel with it. These rails rest on horses placed at right angles to the track, and at the ends are provided with downwardly projecting pins, one of which is on each side of the top piece of a horse. On these rails are boards hinged to the ties or fastened in any suitable manner. The free ends of the boards may rest on the ground instead of on the rails supported by the horses. In sand storms the sand gathers in ridges on each side of the track, encroaches on the track, and finally stops travel. The horses are then placed on top of the ridges, and are pressed down until they have a firm bearing, when the rails and boards are placed on them, the latter having their outer edges a certain distance above the sand. The boards are so arranged that their outer edges will be toward the direction from which the sand blows. The wind passes under the boards and is conducted to the other side of the track, carrying the sand with it. The boards need only be large enough to direct the current of wind so that it will have the desired effect. They may be applied to either side of the track.

The invention was patented by Mr. T. W. Stapleton, of Portland, Oregon, who assigned it to Mr. John G. McBride, 523 Franklin Street, San Francisco, Cal.

AT Reddich, Germany, 14,000 persons are engaged in making needles. The total production of needles in the world is 200,000,000 per week, or 10,000,000,000 per year.

Paper for Uncle Sam's Currency.

The paper on which the United States currency is printed is manufactured at Dalton, Mass., and the Boston *Herald*, in a recent issue, gives the following particulars: Eighteen or twenty Treasury girls, who earn $3 a day, count the sheets, examining each one closely, and rejecting all imperfect ones. An automatic register at the end of the machine registers every sheet as it is cut off and laid down. The register man takes them away in even hundreds, and they are immediately counted in the drying room. In all the various processes of finishing every sheet is counted, and they are again counted on their receipt at the Treasury Department in Washington. The great protection of the government against counterfeiting lies in the paper here made. The distinctive feature is the introduction of colored silk threads into the body of the paper while it is in the process of manufacture. They are introduced while the paper is in the pulp, and are carried along with it to the end of the machine, where it is delivered as actual paper. This has been more fatal than anything else to the professional counterfeiters.

Hollow Magnets.

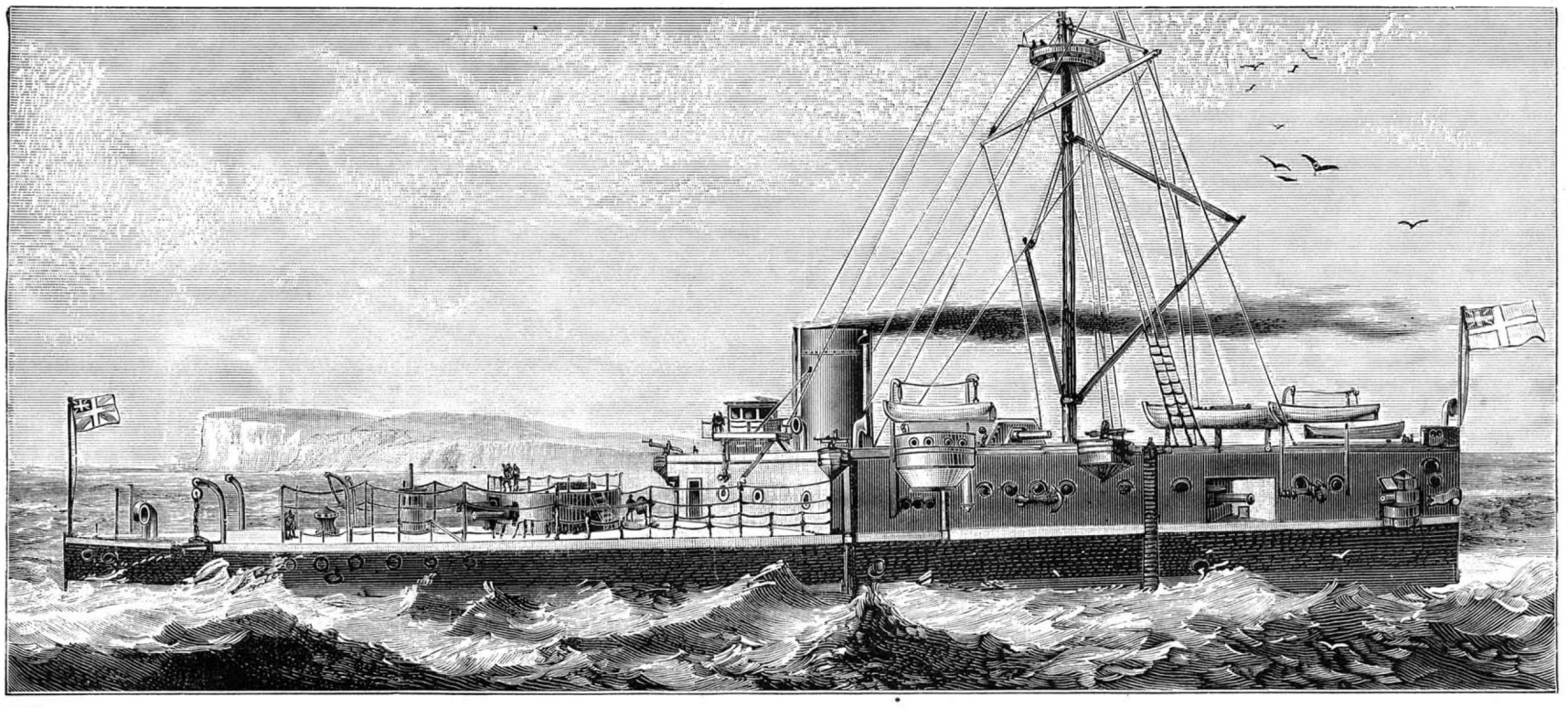
While Preece has found that there is no difference in the conducting power of lightning rods of various forms, Holtz has concluded that solid steel bars do not form so good permanent magnets as tubes, because the core acts as an armature joining the two poles. In experimenting to test his hypothesis, he magnetized rods and tubes to saturation, and found that the magnetism of the tube showed an excess of more than 50 per cent. After waiting six months, he subjected the same magnets to new tests, in order to find which retained the magnetism best. He found that the magnetism of the solid was to that of the hollow magnets, in one case as 1 : 2·5, in another as 1 : 2·9—*Weid. Annalen.*

Refrigerating Steamship for Carrying Fresh Meat.

The screw steamer Loch Ard, of Dundee, lately docked at Cardiff, is a fine vessel of 838 tons net register, and has been constructed specially for the purpose of carrying dead meat from the River Plate to London. The refrigerating chambers leading forward to the main and fore holds are lined with wood and charcoal, and an engine of novel construction draws the air out of the chambers. The air is then compressed and driven through the holds containing the dead meat, the temperature maintained being often 70° below zero. Messrs. David & W. Henderson, of Glasgow, constructed the engines under the patent of Messrs. Bell, Coleman & Co. The steamer will load for Montevideo, and thence take her cargo of meat for London. The voyage out and home will occupy about three months.

The Bottle-Nose Whale.

The *American Naturalist* asserts, on the record of Dr. Gray and Professor Flower, that the ordinary bottle-nose whale is only a variety of the spermaceti whale. According to information derived from a comparison of the bottle-nose with the spermaceti the former has all the characteristics of the latter in its yield of commercial material. Spermaceti is found in the head as in that of the well known spermaceti whale. The bottle-nose attains a length of thirty feet, and then yields two tons of oil and two hundredweight of spermaceti. It feeds upon small cuttlefish and in pursuit of them stays below longer than any others of its order, a fact which makes it difficult to kill. After running out 700 fathoms of line and remaining below two hours, an old male will come up so fresh as to require a second harpoon, and will attack the boats with head and tail. So strong are the muscles of this whale that he can not only leap clear out of the water, but can guide itself in descending so as to plung head first instead of falling helplessly sidewise like the larger whales.



THE NEW STEEL TURRET SHIP CONQUEROR.

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The Science of Beef Tea.

In stewing, the juices are to be extracted more or less completely, and the water is required to act as a solvent as well as a heat conveyer. Instead of the meat itself surrounding and enveloping the juices as it should when boiled, roasted, grilled, or fried, we demand in a stew that the juices shall surround or envelop the meat. In some cases the separation of the juices is the sole object, as in the preparation of certain soups and gravies, of which "beef tea" may be taken as a typical example. *Extractum carnis*, or "Liebig's Extract of Meat," is beef tea (or mutton tea) concentrated by evaporation.

The juices of lean meat may be extracted very completely without cooking the meat at all, merely by mincing it and then placing it in cold water. *Maceration* is the proper name for this treatment. The philosophy of this is interesting, and so little understood in the kitchen that I must explain its rudiments.

If two liquids capable of mixing together, but of different densities, be placed in the same vessel, the denser at the bottom, they will mix together in defiance of gravitation, the heavy liquid rising and spreading itself throughout the lighter, and the lighter descending and diffusing itself through the heavier.

Thus, concentrated sulphuric acid (oil of vitriol), which has nearly double the density of water, may be placed under water by pouring water in a tall glass jar, and then carefully pouring the acid down a funnel with a long tube, the bottom end of which touches the bottom of the jar. At first the heavy liquid pushes up the lighter, and its upper surface may be distinctly seen with that of the lighter resting upon it. This is better shown if the water be colored by a blue tincture of litmus, which is reddened by the acid. A red stratum indicates the boundaries of the two liquids. Gradually the reddening proceeds upward and downward, the whole of the water changes from blue to red, and the acid becomes tinged.

Graham worked for many years upon the determination of the laws of this diffusion and the rates at which different liquids diffused into each other. His method was to fill small jars of uniform size and shape (about 4 oz. capacity) with the saline or other dense solution, place upon the ground mouth of the jar a plate glass cover, then immerse it, when filled, in a cylindrical glass vessel containing about 20 oz. of distilled water. The cover being very carefully removed, diffusion was allowed to proceed for a given time, and then by analysis the amount of transfer into the distilled water was determined.

I must resist the temptation to expound the very interesting results of these researches, merely stating that they prove this diffusion to be no mere accidental mixing, but an action that proceeds with a regularity reducible to simple mathematical laws. One curious fact I must mention—viz., that on comparing the solutions of a number of different salts, those which crystallize in the same forms have similar rates of diffusion. The law that bears the most directly upon cookery is that "the quantity of any substance diffused from a solution of uniform strength increases as the temperature rises." The application of this will be seen presently.

It may be supposed that if the jar used in Graham's diffusion experiments were tied over with a mechanically air tight and water tight membrane, brine or other saline solution thus confined in the jar could not diffuse itself in the pure water above and around it; people who are satisfied with anything that "stands to reason" would be quite sure that a bladder which resists the passage of water, even when the water is pressed up to the bursting point, cannot be permeable to a most gentle and spontaneous flow of the same water. The true philosopher, however, never trusts to any reasoning, not even mathematical demonstration, until its conclusions are verified by observations and experiment. In this case all rational preconceptions or mathematical calculations based upon the amount of attractive force exerted between the particles of the different liquids are outraged by the facts.

If a stout, well tied bladder that would burst rather than allow a drop of water to be squeezed mechanically through it be partially filled with a solution of common washing soda, and then immersed in distilled water, the soda will make its way out of the bladder by passing through its walls, and the pure water will go in at the same time; for if, after some time is allowed, the outer water be tested by dipping into it a strip of red litmus paper, it will be turned blue, showing the presence of the alkali therein; and if the contents of the bladder be weighed or measured, they will be found to have increased by the inflow of fresh water. This inflow is called *endosmosis*, and the outflow of the solution is called *exosmosis*. If an India rubber bottle be filled with water and immersed in alcohol or ether, the endosmosis of the spirit will be so powerfully exerted as to distend the bottle considerably. If the bottle be filled with alcohol or ether and surrounded by water, it will nearly empty itself.

The force exerted by this action is displayed by the rising of the sap from the rootlets of a forest giant to the cells of its topmost leaves. Not only plants, but animals also, are complex osmotic machines. There is scarcely any vital function—if any at all—in which this osmosis does not play an important part. I have no doubt that the mental effort I am at this moment exerting is largely dependent upon the endosmosis and exosmosis that is proceeding through the delicate membranes of some of the many miles of blood vessels that ramify throughout the gray matter of my brain. But I must wander no further beyond the kitchen, having already said enough to indicate that exosmosis is fundamental to the philosophy of beef tea extraction.—*W. Mattieu Williams, in Knowledge.*

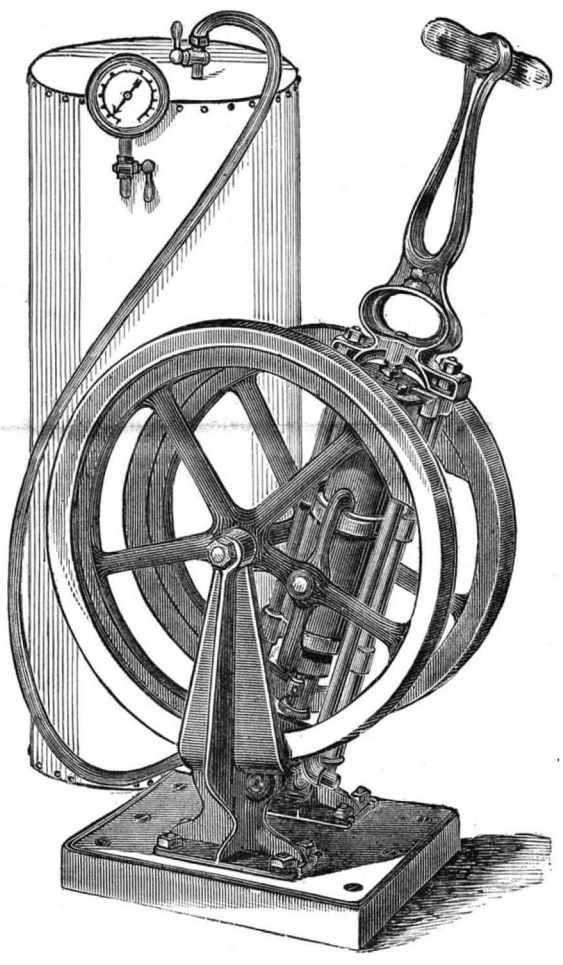
AN IMPROVED HAND AIR CONDENSER.

While no particular difficulty is experienced in pumping air against a pressure of two or three atmospheres, the number of really effective and reliable hand machines for obtaining higher pressures is limited. The great difference between the initial and the final pressures in the pump and the heat resulting from the high compression has a wearing effect upon the machinery, so that in a comparatively short time the cost of repairs will amount to more than its original price.

A power driven air pump, by the same inventor, was illustrated and described in vol. xlvii., SCIENTIFIC AMERICAN, September, 1882. Since then demands have been made for a compressor or condenser that could be driven by hand. The machine herewith illustrated is intended to fill that want.

In the pump shown in the engraving, which is intended to sustain a pressure of 120 pounds to the square inch, the lever holds on its upper end a cylinder of $2\frac{5}{16}$ inches diameter, with a stroke of $5\frac{1}{2}$ inches, and on its lower end a piston, $1\frac{5}{16}$ diameter, fastened to a hollow piston rod, through which the air or gas is expelled.

If we propose to start the pump with the large piston (connected with small cylinder) at its highest, it will, during one-half revolution, draw in the gas through the top valve in the large cylinder; during the next half revolution the filling of large cylinder will be compressed into the small one; the next half revolution will expel the already compressed gas from small cylinder into receiver, while the large cylinder fills itself with a new supply. The pump has no stuffing boxes, and only three valves, both cylinders being single acting. A condenser can be kept continuously running against 160 pounds pressure without injury to the machinery.



IMPROVED HAND AIR CONDENSER.

This improvement is the invention of H. Weindel, 405 North Fourth Street, Philadelphia, Pa.

The Invention of the Telegraph.

We have received an extract from the ninth volume of the *Electrician*, which seems to show that the honor of having invented the electric telegraph really belongs to Edward Davy, a member of the medical profession who, at the advanced age of seventy-seven, is now living in one of the Australian colonies. Davy's original paper appeared in the *Mechanics' Magazine* for 1838. An original manuscript dated 1836, entitled "Outline of a New Plan of Telegraphic Communication, by which intelligence may be conveyed with precision to unlimited distances in an instant of time, independent of fog or darkness," has lately been discovered among Davy's papers by his nephew, Dr. Henry Davy, of Exeter; and this, as well as others, have been placed in the hands of Mr. J. J. Fahie, who is the author of the paper in the *Electrician*. The first idea was to use static electricity for transmitting the signals; but this was soon abandoned, and the electro magnetic properties of the voltaic current was the form of electricity upon which Davy ultimately relied, and the signals were made by the deflections of the needle of a galvanometer. His proposal was to use as many wires as there were letters in the alphabet, but these he subsequently reduced to half the number by making a deflection to the right convey one signal and to the left another. When Cooke and Wheatstone applied for their first patent in 1837, Davy entered an opposition, lodging with the Solicitor-General of the time a full description of his own apparatus; and in November and December of the same year a working model of Davy's apparatus was shown in a room adjoining Exeter Hall. An examination of Mr. Fahie's paper leaves no doubt on the mind that Davy had a very clear notion of the electric telegraph, but it would occupy too much of our space to go into the technicalities and details. It seems that Edward Davy was born in 1806, studied at St. Bartholomew's, and became M.R.C.S. and M.S.A in 1828. He soon gave up medical practice, and became a practical chemist, having a place of business in the Strand; and his ingenuity is evidenced by a "blow pipe," a "mercurial trough," and a "diamond cement," which bear his name. It is probable that he would have succeeded with his invention, just as Cooke and Wheatstone did, had he not lacked three necessary things: (1) backers with money, who believed in him and his inventions; (2) good men of business to advise him; and (3) "push," without which inventive genius is of no avail. Just as he had perfected his ideas, he left England and became one of the assayers to the Melbourne Mint. Had he remained at home to enforce his ideas with the necessary pestilent importunity, he might have reaped the reward of his genius. Davy had genius, but lacked another quality, needful but less lovely, and thus the story of his invention is the story, as Mr. Fahie says, of a "magnificent failure."—*Lancet.*

The Siren Fog Horn.

The Zuyder Zee was recently the scene of some interesting experiments with Professor Holme's siren fog horn. Two steam vessels, the one the Zwalaw, belonging to the Netherland Royal Steamship Company, the other the Hollandia, were each fitted with one of the fog horns, which, though well known in our navy, have up to the present time been used by the Dutch Government as lighthouse fog signals only. The object of the experiments was to ascertain if a small apparatus operated by steam could be used advantageously at sea for signaling on the Morse system of dot and dash. The two vessels left Rotterdam at 10 A.M., and, after passing through the sluice gates, and entering the Zuyder Zee, the smaller of the two ships ceased steaming, while the larger one put out to sea.

Telegraph clerks were employed to manipulate the apparatus, and although the distance eventually became so great that each vessel was invisible to those on board the other, yet the signals reached the ear distinctly, and were at once read off and understood. The unusual and unexpected sounds caused the captain of an outward bound steamer, the Willem III., to suppose the Zwalaw was in distress, and to hasten to her assistance. Upon getting alongside and ascertaining the true cause of the noises, he made no secret of his disgust and steamed away at full speed. After experimenting for about five hours, at distances varying from one to five miles, the signal "Come to us," was given from the Zwalaw, to which the Hollandia replied "We come," and was soon seen steaming toward her consort. There were present Mr. Reeringh, of the Marine Department; Colonel Steppens, Director of the Navy Yard; and the representatives of the various steamship companies. The results of the trials were considered to be in every way satisfactory, and to demonstrate the possibility of one vessel communicating intelligence to the other at sea although separated by a considerable distance. The experiments were conducted by Messrs. De Wit, engineers of Amsterdam, and Mr. C. Ingrey, C.E., the engineer of the Caloric Engine and Siren Company, of London.

How Salmon are Increased.

At Astoria, Oregon, all the offal of the salmon used for canning is thrown into the sea at the shore, the canneries being so situated that the great Pacific Ocean, at the mouth of the great Columbia River, receives all the rejected matter. According to the *Portland Oregonian*, this seeming wastefulness is a means of a constant reproduction of the salmon. The first operation in the canneries, he argues, is to relieve the fish of their entrails, fins, heads, and spawn, and these, in almost every instance, are dropped directly into the river. Much of the spawn, of course, is eaten by fish or destroyed, but a goodly share, he thinks, finds lodgment on the bottom, where in the natural process it hatches. It is a fact well known that the water about the canneries fairly swarms with young fish during the summer and fall.

A Result of Co-operation.

Workingmen managing a co-operative establishment, and performing their own labor, would undoubtedly experience seasons when they would be compelled to accept not only smaller dividends but lower wages, in order to have any dividends at all. Still it is well known that men when working for themselves will put up with privations, and hardships even, which they would not think of submitting to, if imposed upon them by others. One of the indirect advantages of co-operative production will be the cultivation of economy, saving, and thrift among the workingmen who engage in it. The interest in such an establishment would form a nucleus to which every honorable and ambitious workman would have a just pride in adding something every month.—*Western Manufacturer.*

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Correspondence.

Remedy for Leaky Pens.

To the Editor of the Scientific American:

The stylographic pen is a great convenience, but no inventor seems to have succeeded thus far in making a joint which will prevent soiling the fingers with ink. A remedy for this leakage which has been tried, and thus far seems to be complete, is to rub the joint on which the fingers rest with the thin edge of a piece of wax. Hold the pen over a candle, lamp, or the flame of a match till the wax melts, when it will lute the joint so that no ink can escape throught it.

M. C. MEIGS.

Washington, D. C., Oct. 9, 1883.

Hearing at a Distance.

To the Editor of the Scientific American:

The notes that have been appearing in your paper of late in regard to the distance at which certain sounds can be heard have interested me very much. A writer in a late number (H. W. Hubbard) asks if the rumbling of trains can be heard farther than their whistles. On this point I would say that the sound of running trains on the Lake Shore Railroad can be distinctly heard at this place, almost any still night, while the whistle is very rarely heard. The nearest point on this road to us is about nine miles and a half. I have often heard locomotive whistles ten miles in another locality.

ORANGE COOK.

Chardon, O., Sept. 27, 1883.

Notes Taken in Sixty Years.

To the Editor of the Scientific American:

My attention has been called to a statement in the SCIENTIFIC AMERICAN SUPPLEMENT, 15th of September, 1883, to the effect that I am about to publish a book entitled "Notes Taken in Sixty Years."

As this error has been extensively copied, please correct it. Sixty years would take me back to a very early period of my infancy. The error has arisen from the fact that Mr. R. S. Elliott, formerly Secretary of the South Pass Jetty Company, is publishing an interesting book with the above title, in which my name occurs in several passages relating to the jetties and the improvement of the Mississippi River.

JAS. B. EADS.

St. Louis, October 9, 1883.

Vibration of Bridges.

To the Editor of the Scientific American:

In your issue, vol. xlix., No. 12, 22d September, you have a notice of an article which I had prepared and submitted to the American Society of Civil Engineers for criticism and suggestions. In your notice you make me say that the Harper's Ferry bridge had been moved four inches; it is thought that from this notice of yours some sensational reporter published an item saying that the Harper's Ferry bridge had been condemned as unsafe for heavy trains; this is calculated to injure our road. I am sure I did not say Harper's Ferry bridge, but Harper's Ferry trestle, which is a structure on shore, and quite a different thing from the bridge. There has been no perceptible movement of the Harper's Ferry bridge; it is too heavy to be moved by passing trains. If I said bridge, I did not intend to do so and feel sure I did not. I think to be scientific is to be exact.

JAMES L. RANDOLPH.

Baltimore and Ohio Railroad,
Baltimore, October 6, 1883.

[Our notice was from the official report of the Society's proceedings as furnished to us by the Society.—EDS. S. A.]

Making Graduated Circles.

To the Editor of the Scientific American:

In almost all pieces of apparatus for measurement, graduated circles are required; and many students of physics and mathematics who are compelled to construct their own apparatus leave valuable pieces incomplete or only roughly accurate for want of properly divided circles. In fact, many geniuses of limited means who would gladly enter into systematic experiments on different subjects never begin because of this want.

The great difficulty in constructing dividing or graduating machines is to obtain a circle with the exact number of teeth required, to which the circle to be graduated may be attached and turned by a tangent screw or by some other means. This I have accomplished in a very simple manner, which any one can easily repeat, who has access to a lathe. It is as follows:

Having obtained a brass rod, say ⅜ inch square, form it into a ring of the required size to receive the teeth, say 360, 720, or 1080, and leave the ends, without uniting, a little longer than necessary. Place in the lathe the tap with which the teeth or threads are to be cut.

By means of the tool post and carriage, press the brass ring, beginning at one end, against the tap and turn the lathe. The ring will feed itself around, which may be repeated until the teeth are deep enough. It is best to have a small roller on the tool post, but if both post and brass are smooth, they will work satisfactorily if kept well oiled.

The ends may now be joined by cutting away half of each, so that they will lap about two inches, and riveting, being careful to have the threads hit, and of the right number. This ring may now be placed as a tire around a suitable wheel to be turned by a tangent screw of the same kind as the tap with which the threads were cut.

With this kind of a wheel I have constructed a machine which is perfectly automatic for any size circle to be graduated on the face, edge, or bevel of any angle. The marking is sufficiently accurate for all ordinary purposes. The expense was only $5.

REYNOLD JANNEY.

Wilmington, O., Sept. 17, 1883.

[With our correspondent's kind permission we would add: The tap is held by the chuck in the ordinary way; the ring is placed in a horizontal position between the tap and tool post, so that the threads will be cut across its outer surface; the ends of the rod should be cut in a plane making an angle with the plane of the wheel, so that the riveting will be done on the side. The device is easily made and effective, and by making the number of teeth on the wheel a multiple of each number of teeth most generally needed, it will cover a wide range.—ED. SCIENTIFIC AMERICAN.]

Manufacture of Steel Rails.

During the recent meeting of the Steel Institute the members paid a visit to the steel works of Messrs. Bolckow, Vaughan & Co., at Eston—or the Cleveland Steel Works, as they are called. They adjoin the blast furnaces of the firm at Eston and South Bank, the latter range of furnaces being merely separated from the former by the Middlesbrough and Saltburn branch of the Northeastern Railway, which passes between them, and is connected with the sidings of both the works. The works are also connected by a private line with a fine jetty on the banks of the Tees, provided with ample appliances for the rapid unloading of foreign ore, etc., and for the shipment of rails.

There are now at the Cleveland Steel Works six converters, each of 15 tons capacity, devoted to the basic process. These converters are disposed in two groups of three each, the whole six converters being in one straight line, and each group having it front of it a shallow double pit in shape somewhat like the letter B, and provided with two hydraulic ladle cranes. The section of the building containing the converters and pits is spanned by steam traveling cranes by which converter bottoms, etc., can be lifted, and by which the charges of lime are brought to the converters in suitable iron hoppers. At the back of the converters and at a convenient height runs a charging stage, along which are conveyed to the converters in ladles mounted on carriages the charges of molten iron from the blast furnaces, and from which the converters also receive the additions of hematite and spiegel. The staging is provided with the necessary hoists, and behind it again is a space devoted to the preparation of the converter bottoms, hoods, etc., the plant in this department including mortar mills for the mixing of the magnesian limestone with tar, large ovens for the firing of the bottoms, etc. The bottoms, we may mention, are rammed by hand, the men using redhot bars for rammers, and the tuyere holes for the blast being formed by iron cores inserted in the mould. The material is well rammed around these cores, and the latter are as a rule knocked out before the bottoms are fired.

Returning to the front of the converters, it will be readily understood that by the arrangement of ladle cranes above mentioned, either crane can command two converters. The processes of pouring from the converter to the ladle, and the subsequent teeming of the steel into the moulds, are the same as in the ordinary Bessemer process, but the quantity of slag to be dealt with is much greater—being about one-third the weight of the steel—and it is the practice to pour off a great portion of this slag from the converter immediately after the "after blow," as it is called (this being the name given to the part of the blowing which lasts after the elimination of the carbon), and prior to the addition of the spiegel.

The rail ingots cast are 15½ inches square, and vary in weight from 1¼ to 1½ tons, according to the section of rail to be rolled. As soon as possible after teeming they are taken from the moulds, placed on trolleys, and run off by small locomotives, running on lines of 3 foot gauge to the range of gas furnaces, where they are wash-heated, or rather where their heat becomes equalized throughout, the amount of real heating done in these furnaces being comparatively small, and there being, it must be borne in mind, no subsequent heating whatever.

After having remained a sufficient time in these furnaces the ingots are drawn out by a very simple arrangement of hydraulic gear, each ingot as drawn being received by a trolley which is at once towed off by one of the small locomotives to the cogging mill. The cogging mill is a reversing mill with 48 inch rolls, and here in the course of eleven passes the ingot is rolled down from 15½ inches square to a bloom 8 inches square. The cogging rolls have six grooves, the ingot making two passes through each groove, except the last. After the first pass through each groove is made, the rolls are screwed down for the return pass, and then released again before the first pass is made through the succeeding groove, and so on.

From the cogging mill the bloom is conveyed to a powerful horizontal shearing machine, where it is cropped and delivered on to a narrow gauge trolley placed on a line below the level of the floor of the mill. One of the small locomotives running on a parallel line of rails is then attached to this trolley and tows it up a short gradient to the mill floor level, and runs it along at great speed to the finishing mill.

This is a reversing mill driven by a pair of engines attached to it direct, and it has a set of roughing and a set of finishing rolls, each 30 inches in diameter. After the partially formed rail has made six passes through the roughing rolls, a series of chains running in grooves below the floor level, and furnished with horns projecting above that level, are brought into use, and transfer the rail laterally to the finishing rolls, through which six more passes are made. On leaving the rolls after each pass the rail is received on rollers, which are allowed to roll through a limited range on slight inclines, so that the rail resting on them has a constant tendency to feed itself down to the rolls. During the latter passes, to economize floor space, the incline receiving the rail is carried up at a considerable angle above the floor so as to allow of traffic passing beneath it. Rails up to 150 feet long or upward are dealt with at Eston with as much ease as shorter lengths, and at the time of their visit, on the 18th of September, the members of the Iron and Steel Institute were able to see rails about 126 feet long rolled off steadily rail after rail without the slightest hitch of any kind, the time occupied in making the twelve passes through the roughing and finishing rolls being 80 seconds only. This is magnificent work, yet so smoothly did all the operations proceed that it was difficult to realize that the mill was turning out finished rails at the rate of something over a ton per minute. As a matter of fact, we believe that over 400 tons of rails have been produced in a ten hours' shift at this mill.

From the finishing mill a series of live rollers convey the rail to the saw, where it is cut into lengths as required. In the form of hot saw used at Eston a massive framing carries a pair of diagonal engines from pulleys, on the raised crankshaft of which belts are led off to pulleys on the saw spindle situated a little above floor level. The whole framing, with engines and saw, is mounted on wheels and moved forward at each cut.

From the saw the rails are run forward on to the rail benches near the middle of the length of the latter, a neat arrangement, worked by a small pair of engines, enabling them to be pushed along the benches to the right or left as may be required. Running over the range of hot rail benches also is a powerful traveling crane, by which bundles of rails can be easily transferred from one part to another as may be necessary to suit the working of the men at the straightening presses.

The hot rail benches are at such a level that the rails can be readily run off from them to the straightening presses, and after being straightened they are passed on to the rail-ending machines and the drilling machines, being finally delivered at the western end of the works. Of the rail finishing plant it is unnecessary to say more here than that it is admirably arranged, and comprises first-class machinery for the several operations to be performed.

So far we have been speaking of the basic side of the works only. On the side devoted to the acid, or ordinary, Bessemer process, the arrangements are very similar. In this case, however, there are four converters of eight tons capacity arranged in the manner to which we made reference in the early part of the present article. The cogging mill on this side, also, serves either of two finishing mills, these being driven by one engine situated between them. Altogether about 5,000 tons of Bessemer steel per week are being turned out at Eston by the two processes.

The blast for the converters is supplied by four vertical blowing engines, three of these having been made by Messrs. Daniel Adamson & Co., while the fourth was constructed by Messrs. Bolckow, Vaughan & Co. themselves. The Siemens wash-heating furnaces are altogether twelve in number, and are each 25 feet long by 10 feet wide, and provided with four doors; they are both charged and drawn by hydraulic machinery. The steam required in the works is supplied by 42 Lancashire boilers, all made of steel. Of the blast furnaces we need at present only say that there are nineteen, of which ten are fitted with Cowper hot-blast stoves.

We have in the foregoing columns given but an outline description of Messrs. Bolckow, Vaughan & Co.'s magnificent works at Eston, and the space at our disposal will not permit of our at present doing more than this. We trust, however, that we have been able to give some idea of the productive power of these works, and of the skill with which that productive power is turned to the best account. In the completeness of their arrangements for the rapid handling of the material in the course of manufacture with the minimum of hand labor, the Cleveland Steel Works are probably unequaled in the world, and the impression received during the inspection last week will, we are certain, long be remembered by all who took part in the visit to Eston.—*Engineering.*

Death of Prof. Plateau.

Foreign journals announce the death, on the 15th of September, at the venerable age of eighty-two, of Joseph Antoine Ferdinand Plateau, Emeritus Professor at the University of Ghent, and one of the most eminent of modern physicists.

Prof. Plateau was a foreign member of the Royal Society of London, a member of the Academy of Sciences of Berlin, and a corresponding member of the Academy of Sciences of Paris. To those who are interested in that department of science upon which he shed so much luster, his many labors are familiar.

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Stereoscopic Portraits by a Single Camera.

We have just taken, by means of a single 4 x 5 camera, some stereoscopic portraits of so excellent a quality and by means so simple as cannot fail to interest our readers and cause many of them to do likewise after they read our description.

Every one is, of course, aware of the existence and nature of an office chair, the seat of which rotates upon a central axis—usually a screw—of the same nature as that of a piano stool. Now if a sitter be posed in a chair of this nature, it stands to reason that when a camera is placed at a distance of a few feet away, the mere act of rotating the chair upon its pivot, and with it the sitter, will cause the latter to be presented to the lens under circumstances of horizontal displacement extending to 360 degrees, or equal to the entire circle.

Having posed the sitter according to taste, and being provided with a double dark slide containing two plates, the first exposure is made and the sitter enjoined to remain perfectly still while the chair is rotated to an *exceedingly slight extent* —an extent, indeed, that shall not be more than is barely appreciable—and another exposure made on the second plate. When developed and printed from, these negatives will yield proofs which shall be truly stereoscopic.

Care must be taken that the rotation of the sitter be not carried too far, else will the effects obtained be vulgarized by the exaggeration of the relief. It is so very easy to produce this artificial relief, and the temptation to do so is so great, that the photographer must be on his guard against indulging in this trick, which, while calculated to startle the spectator, is as "untrue in nature as in art."

It cannot, however, be denied that some exceedingly funny and grotesque effects can be obtained by indulging in an excess of this movement of the sitter in azimuth. We have witnessed immoderate laughter being elicited when the portrait of a person whose nose was naturally rather large was presented for examination in the stereoscope, which showed it to project at least three or four inches in advance of his face. This effect was produced by bringing the camera within five feet of the sitter, and causing the chair to be rotated two or three degrees more than it ought to have been. In like manner may an individual whose face is rather thin be presented as decidedly hatchet faced, while the likeness otherwise remains so good as to cause ready recognition.

While experimenting in this direction, the photographer will not fail to notice what striking and novel effects can be obtained when a back view, either wholly or partially, of the sitter is focused upon the ground glass. If any readers who adopt the practice of photographic portraiture as *dilettanti* rather than as professionals will occasionally deviate from the regular habit of photographing their friends full or three-quarter face, and try instead, say, a full or three-quarter *back* view, it will afford an agreeable modification in the routine of their practice.

The method which we have just described of rotating the sitter in relation to a single lens camera, is one equally sound in principle as easy in practice for producing true stereoscopic effect in portraiture. But it must be noted that the stereoscopic effect is confined to the sitter only, and has no relation to him (or her) and the background. For this reason, the practice of stereoscopic portraiture by the means described should be confined to busts, and the backgrounds should be quite plain.—*Photo. Times.*

The Bitumen of Judea.

An interesting investigation of the nature of this natural product of Judea and the Dead Sea has been made by M. B. Delachanal, who has communicated his results to the French Academy of Sciences. It is employed in Palestine as an insecticide on the vines, and hence the recent attention it has attracted in France, where *savants* are still engrossed with the problem of fighting the phylloxera. Some kilogrammes of the bitumen were procured from the French consul at Jerusalem by M. De Lesseps, and on this M. Delachanal has operated. He finds the presence of a considerable quantity of sulphur in its composition. It is a deep brown color, nearly black, and of a friable nature. It contains 27 per cent of oil, which is nearly colorless and of the nature of petroleum. A solid paraffine can also be extracted from it. The result of these experiments is that the bitumen of Judea, if it prove efficacious as an insecticide, may also be turned to good account by the manufacturing chemist in the production of sulphur and illuminating oils. The presence of sulphur in its composition appears to assign to it a mineral, not organic, origin. Should the Dead Sea Canal be constructed, it is probable that profitable trade may arise from this natural product.

NEW GAS ENGINE PUMP.

Our engravings represent the "Crown" gas engine, adapted for pumping purposes, now being manufactured by the National Meter Company, of 51 Chambers Street, this city. The smallest size is here shown, capable of pumping 200 gallons of water 50 feet high per hour, at an expense of one and three-fifths cents, estimating gas at $2 per thousand feet. Fig. 1 is a perspective view, and Fig. 2 is an elevation, showing the valves in section. The engine frame is supported upon two legs above the base to make room for the pump, *b*. The power cylinder is placed horizontally upon one end of the frame, and the motion of the piston is communicated to the pump through the rocking arm, *c*, and the vertical rod operating the piston of the pump. The crank, *a*, is connected to the lower end of the rocking arm by a connecting rod. In the back of the power piston are two springs which are furnished with a central guide ring, into which the end of the piston rod enters. This end of the rod is convex and made of tempered steel, and rocks upon the face of the tempered piece. The piston rod is held against its seat by a spring bearing upon the end of a steel pin inside the rod, so that it is held in its place by the pressure of the spring. There is no sliding motion in this connection, but a rocking one; and the whole makes a flexible and frictionless connection. All bearing journal pins are made of tempered steel, and are ground to size. The pump cylinder is of composition, the valves being of the best rubber composition for water valves. The water is forced or lifted through the upper part of the pump, thence through a cored passage in the frame to the chamber, *l*, in the cylinder. The air chamber serves to equalize the flow, and the water escapes through the outlet, *k*, on the opposite side of the engine from that shown in the engraving. A flywheel, which is not represented, in Fig. 2, gives steadiness to the motion.

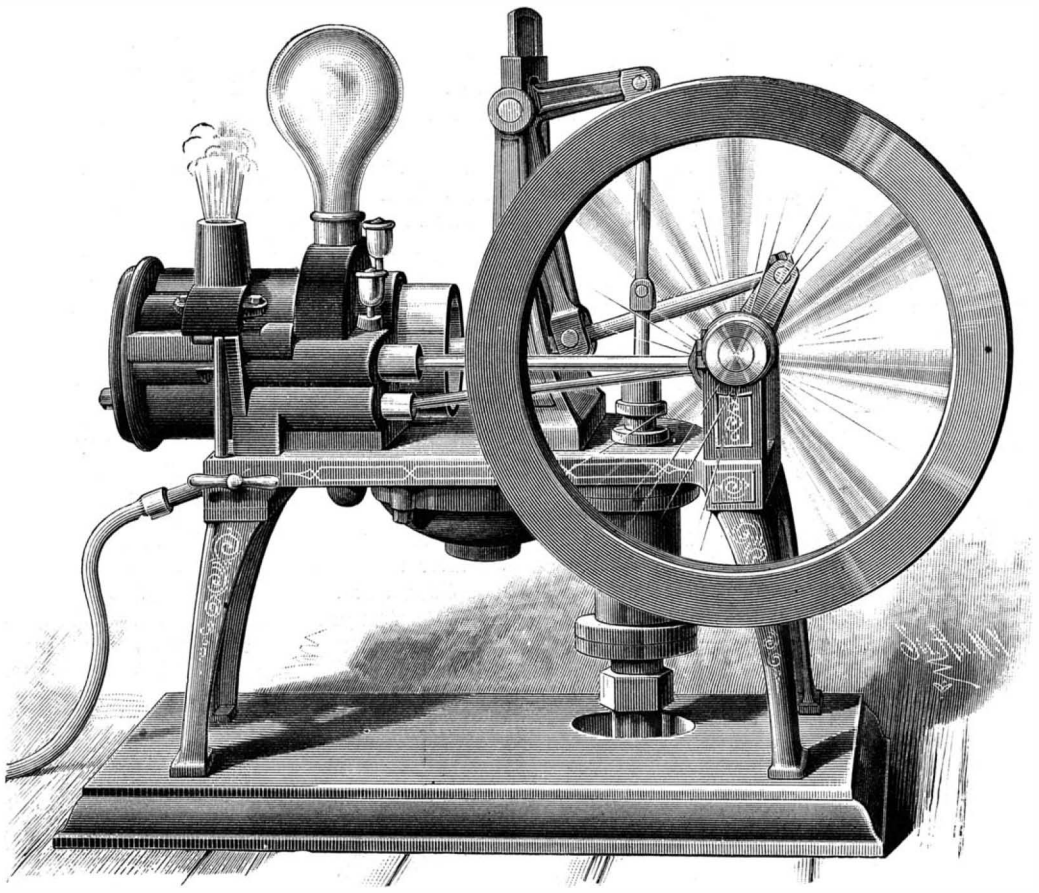

Fig. 1.—NEW GAS ENGINE PUMP.

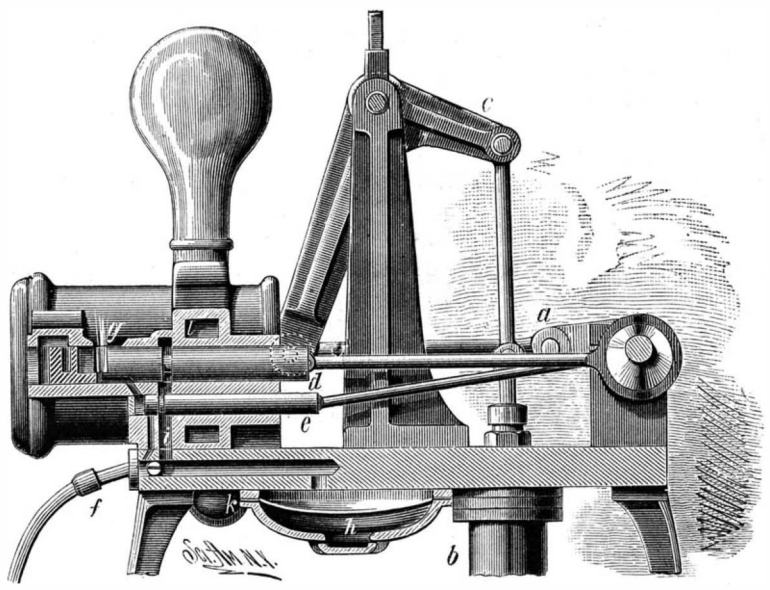

Fig. 2.—NEW GAS ENGINE PUMP.

The valves, *d* and *e*, are solid, and are fitted so accurately as to need no packing, the work to which they are subjected is so light that they will not require it. Air is admitted to the cylinder by the valve, *d*, while gas is admitted by the valve, *e*, to supply the charge, this valve also regulating the flow of gas to the lighter jet at *g*. At the instant the flow of gas and air to the cylinder is stopped, the valves close and the charge is exploded. The gas supply is received through the pipe, *f*. The action of the combined valves is positive and simple, and there are no loose working parts to get out of adjustment. The valves are operated by independent eccentrics on the main shaft. The engine occupies a floor space 8 x 21 inches, is 17 inches high, and weighs 100 pounds.

The company also manufacture engines for general use from a size suitable for driving a sewing machine, up. The engine can be seen in operation at Chase's, No. 12 Cortlandt Street, this city.

A Green Colored Sun.

A remarkable phenomenon has been observed lately at several places in the Madras and Bombay Presidencies, and has caused much interest, mingled with not a little alarm among the superstitious. For some days the sun presented a distinctly green color. Several explanations have been put forward, of which the most plausible appears to be that offered by the Government Astronomer, that it is due to the passage across southern India of clouds of sulphurous vapor from the Java volcanoes.—*London Times.*

New United States Magazine Gun.

The Chaffee-Reece magazine gun is one of the three species of arms that were not long ago approved after thorough trial, by the United States Army Commission. This gun is now being manufactured at the United States works, Springfield, Mass. We have lately seen the original arm which formed the pattern for the manufacture. Prior to approval it was fired 8,000 times, and subjected to all the required tests of rust, sand blast, etc.; but it still looks almost as good as new. One of the peculiarities of this gun is the facility with which its magazine is loaded, the cartridges being simply dropped in at the breech, and the ease with which it is changed from magazine firing to the ordinary hand inserted cartridge. This is done by simply moving a small button. A single motion removes the discharged shell and inserts the new cartridge ready for firing. Altogether it is a remarkably effective weapon.

In the use of novel arms like this the modern soldier is required to exhibit on the battle field qualities of a totally different nature from those of the ancient warrior. The latter was valiant and effective in proportion as he worked up his nervous system to a condition of excitement and frenzy. But the soldier of the present day, using the repeating gun, must be thoroughly drilled in self-control. He must be extremely calm and collected in the presence of the enemy, take careful aim, fire no random shots; otherwise his superior arms count for nothing, his ammunition becomes rapidly wasted, and he has no recourse except flight.

Chronic Lassitude.

There are certain characteristics connected with a lazy man which are admirable. They excite in the twanging, jingling breasts of the nervously fidgety a feeling which borders on respect and is akin to awe. Your double geared fidgety man will spin all day like a top and run down in the cool of the evening on the identical spot on which he started off after breakfast. The man suffering from chronic lassitude will keep still, keep cool, keep in the shade, put in a full day's work resting himself, and arrive on time at sundown, cool, calm, and collected, without having once sweat under the collar or laid a hair.

The professional lazy man seems to eat, drink, and sleep with as much gusto and *sang froid* as his fidgety brother with the high pressure anatomy and patent double cylinder, fast, perfecting, hygienic apparatus, who gets hot in the box, and wears and grinds and cuts his life away like a piece of misfit machinery. The fact of the business is, the man of bustle wears his life away for the want of the oil of rest. The lazy man just soaks along like a handful of cotton waste in the oil cup of a box car axle.

BEES taken to Florida become lazy, and make only as much honey as they need from day to day.

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Catechu for Dissolving Boiler Incrustations.

Berlin is in possession of a pneumatic postal system, whereby letters can be sent through tubes by compressing the air behind or exhausting it in front of the package. Power is, of course, required, and is furnished as usual by steam.

In the selection of tubular boilers, says the *Deutsche Industrie Zeitung*, it was assumed that the water supplied by the Berlin water works was as free as possible from salts that produce incrustations, for the tubes lie so close together that it is almost impossible to clean the boilers.

After the boilers had been running a few months, however, it was found that a very hard incrustation was forming, that had already reached a thickness of 1½ inches. In consequence the boilers had to be cleaned every two months during the first two years that they were in use, and this was no small difficulty, for it had to be cut out. This induced them in the third year to try the experiment of adding *pure catechu* to the feed water. Eleven pounds of catechu were put in a boiler that had been well cleaned, and spread out over all the plates exposed to the fire, and each boiler was run eight weeks. At the end of that time there was no trace of any hard incrustation, but merely a slime that was easily removed.

This process has now been in use for four years in all the steam boilers used by the pneumatic dispatch, so that if the catechu has any injurious effect on the boiler or the machinery, it would have shown some trace of it before this time. This is by no means the case, nor can it be, for the quantity added is extremely small in proportion to the amount of water evaporated. The boilers in question evaporate, on an average, in the thirteen working hours, four cubic meters (about 140 cubic feet) daily, and only receive 11 pounds of catechu every two months, so that there is only 1 gramme of catechu to 48 kilos of water, or 1 to 48,000.

The catechu forms a paste or dough in the boiling water and rests on the plates over the fire; but as the stream of feed water is also directed to that place, it always comes in contact with fresh feed water.

It is true that catechu had been used with other chemicals years ago under the name of "incrustation powder" (*Kesselsteinpulver*), but this mixture exhibited the action of pure catechu only to a slight extent, and besides this it was added every day and required special feeding apparatus, so that it was very expensive.

SACRED EGYPTIAN SCARABÆUS.

The sacred Egyptian scarabæus (*Ateuchus sacer*) is in a biological as well as in an archæological sense the most interesting beetle which inhabits the countries of the Mediterranean. It has been made famous by the honors paid to it by the ancient Egyptians; it played an important in their animal worship. It is represented in their hieroglyphics, and displayed upon their monuments, and, hewn from stone in colossal proportions, was placed in their temples. Adrian speaks of it, and Pliny says, "This beetle makes monstrous pills of manure, rolls them backward with its feet, lays small eggs in these balls, from which beetles emerge, the ball serving as a protection to the young."

In cases of fever, besides the means employed by medical science, it was thought to be efficacious to bind on one of these beetles.

The head is semicircular with six deep indentations. These beetles fix upon a piece of manure, preferably cow dung, bear it away from the heap, and knead it into an irregular ball, in which the female deposits an egg. After they have made the ball, which is often larger than themselves, they roll it to a convenient spot, using their hind legs to direct the ball, and the other four legs for locomotion, so they seem to be standing on their heads, as the hind legs are elevated to guide the ball. Often one of the beetles pushes the ball with its head. This ball, which at first was uneven and soft, becomes, by much rolling, firm and smooth. They then dig a deep hole, in which they bury the completed ball. The filling up of the hole with earth finishes their wearisome labor, which was necessary to prepare a place for their young.

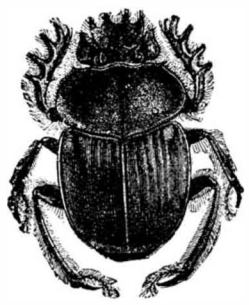
A second and a third egg require the same labor. At last, enfeebled by their labors, the beetles remain near the place where they have buried the balls and die. New life is developed in the buried balls, and the larva, as it emerges from the egg, finds a rich supply of provisions, by means of which it attains its full growth. It takes several months for the development of the larva. The next spring the beetles come forth from their birthplace, and the young, following the example of the parents, roll up balls in their turn.

A German artist in one of his excursions into Italy observed a beetle employed in rolling a ball upon uneven ground. Unfortunately the ball rolled into a hollow, and the beetle exerted itself to the utmost to roll it out again; but finding its efforts in vain it went to a neighboring manure heap and disappeared in it, but soon came forth again accompanied by three beetles. All four labored with their united strength, and at length succeeded in rolling the ball from the hollow. Scarcely were their efforts crowned with success than the three assistant beetles left the place and returned to their dwelling place.

Beetles possessing similar habits are found in almost every part of the globe, but they are not all equally skillful in the construction of the balls for containing their eggs.—*From Brehm's Animal Life.*

NATURAL HISTORY NOTES.

The Constancy with which Insects Visit Flowers has recently been the subject of an investigation by Messrs. A. W. Bennett and R. W. Christy, and the results of their observations



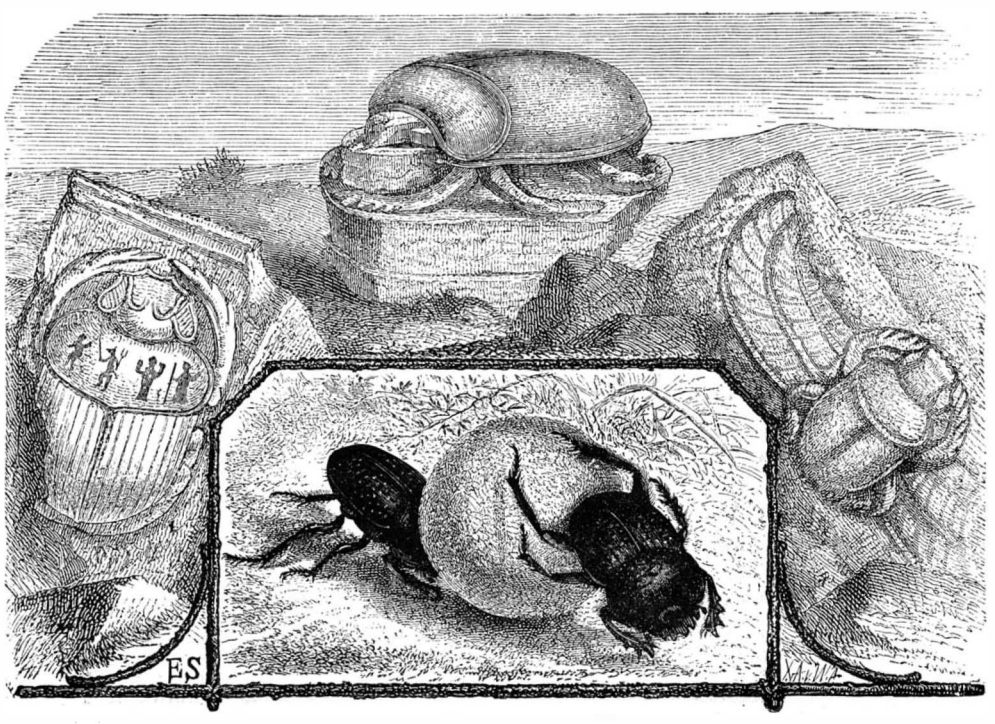
SACRED EGYPTIAN SCARABÆUS.

are printed in the *Journal* of the Linnæan Society for August 14. Although very interesting the subject is not new, Aristotle having made the assertion that "during each flight the bee does not settle upon flowers of different kinds, but flies, as it were, from violet to violet, and touches no other species till it reaches the hive." Messrs. Bennett and Christy, however, did not confine their studies to the bee family, but extended them to various species of Lepidoptera and Diptera, and have placed on record a large number of interesting details. With respect to butterflies, Mr. Bennett thinks that, upon the whole, they exhibit but a small degree of constancy in visiting flowers, though the majority of those upon which they were observed to settle were either yellow or pink; and, after settling upon one of these colors, they appeared to show a marked tendency to adhere to it. Two species of Syrphidæ, or "hover flies," also showed little constancy, though this may be accounted for by the fact that these insects are rather consumers than carriers of pollen. But the Apidæ, or bee family, exhibited much greater constancy. Thirty-three observations were made upon different species of *Bombus*, or "humble bee." In four instances the bee visited the flowers of three distinct species, irrespective of color; in six instances the flowers of two species were visited, the color of which was nearly the same; and, in twenty-three instances, the bee confined itself to a single species, though the plants chosen by the different bees were of the most various kinds and colors—some shade of pink, however, largely predominating. There could be no doubt as to this constancy being intentional, the bee frequently traversing a considerable distance, without alighting, so as not to mix its pollen. But it would appear as if color were not the sole guide, since both observers found that the same bee would visit white and purple foxgloves indifferently, while passing by flowers of any other species. The common hive bee was observed six times, and only upon one occasion was it seen to visit the flowers of more than one species, and then it made one visit to the blue scabious (*Scabiosa succisa*), followed by nine in succession to the pink centaury (*Centaurea scabiosa*). Another bee paid twenty-four consecutive visits to the flowers of the saw-wort (*Serratula tinctoria*), obviously rejecting those of the knapweed (*Centaurea nigra*), which are not unlike them in general appearance, and which are of nearly the same color. It is an interesting circumstance, to which Mr. Bennett calls attention, that the constancy of the insect appears to be in proportion to the part performed by it in carrying pollen from flower to flower. Mr. Christy's observations are confirmatory of those of Mr. Bennett. He considers the hive bee to be perfectly methodic in its habits, at any rate while there is a fair supply of flowers, though when these are scarce it may not be quite so scrupulous. He also thinks that humble bees show a fairly high degree of constancy. The Lepidoptera observed by him were not so numerous as those watched by Mr. Bennett, but they seemed to exhibit more constancy.

"A much larger number of observations," says Mr. Bennett, "is, however, needed in order to determine with certainty any general law; and especially a careful microscopic examination of the pollen attached to the probosces, mandibles, legs, and under side of the abdomen and thorax. As regards preference for particular colors, the Lepidoptera paid, while under observation, 70 visits to red or pink flowers, 5 to blue, 15 to yellow, 5 to white; the Diptera, 9 to red or pink, 8 to yellow, 20 to white; the Hymenoptera, 203 to red or pink, 126 to blue, 11 to yellow, 17 to white."

Influence of Position upon Seeds.—A paper with this title was read by Dr. E. L. Sturtevant at the recent meeting of the American Association. The "position" referred to in the title is that of the individual seeds grown on a spike. The object of the experiment was to ascertain the difference in germinating power between seeds from the middle and from the ends of the spike. In experiments conducted at the New York Agricultural Experimental Station last winter it was found that, on an average, 91 per cent of butt-kernels, 88 per cent of central kernels, and 98 per cent of tip-kernels of flint corn germinated. Other experiments gave the following results: Of the butt-kernels planted, 79 per cent germinated; of the centers, 84 per cent; and of the tip-kernels, 86 per cent. For flint corn, the tip-kernels have the strongest vegetative power.

The Gardener Bird of New Guinea.—The gardener bird (*Amblyornis inornata*), a native of the Arfak Mountains in New Guinea, and the first report of the existence of which was brought to M. Bruijn by Malaysians, appears from the studies of M. Beccari to excel the Australian bower birds (to which it is allied) in the erection of a pleasure bower. The center of its edifice is formed by a small shrub in an open spot in the forest. Moss is piled up around this, and then a number of branches plucked from an epiphyte are planted in the soil in an inclined position, so as to form the walls of a conical hut, which is entered through a small aperture. These branches continue to vegetate for some time. In front of the entrance the bird makes a lawn of tufts of moss carefully separated from adhering pebbles, particles of wood, or other plants. Upon this green carpet he strews the violet fruits of *Garcinia* and the flowers of a species of *Vaccinium* growing near, renewing these as they wither.



SACRED EGYPTIAN SCARABÆUS.

Selenotropism of Plants.—Mr. Ch. Mussat (*Comptes Rendus*, xcvi., page 663), struck by the heliotropic movements of plants, has made some experiments on the influence of the moon. He sowed seeds of plants noted for their sensitive properties, such as *Lens esculenta, Ervum lens*, and *Vicia sativa*. When the plants were a few centimeters in length they were placed in the dark. The branches thereupon became delicate, long, and white, while the leaves were tinged with yellow. On the 22d, 23d, and 24th of February, when the sky was exceptionally clear, they were exposed to the direct light of the moon from 9 P. M. to 3 A. M. Almost immediately the branches became curved, and presented their concavity and terminal bud toward the moon. The bud seemed to follow the moon, and, when the plants were placed at a window with a western aspect, a fresh movement was observed, and this continued until the moon disappeared behind the hills. M. Mussat proposes to call such movements *selenotropic*.

The Oregon.

The Guion fleet of steamships has been enlarged by the addition of the Oregon, a steamer which is 520 feet long, 54 feet wide, 40 feet 9 inches deep, and has a tonnage of about 5,000 tons. As accommodation is provided for 542 passengers, the arrangements for ventilation must be proportionally effective. The cabins, staterooms, dining rooms, and steerages are ventilated by means of twenty-six patent air pump extracting ventilators and twenty patent down casts. They are all of 24-inch diameter, with 12-inch pipes. By means of these appliances there can be no doubt that the traveling public will have all the sanitary comforts at sea that they can have in a well arranged hotel on shore, and this is the principle which the owners of the fleet have in view.

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A Gigantic Flour Mill in California.

The competition of India and Russia in the western European wheat markets is causing the merchants of California to use every effort to maintain their footing, and among other devices, says *Engineering*, for lessening the cost of transport there is arising the practice of reducing the grain to flour before it is shipped, thereby effecting a saving of 20 per cent in freight. This carries with it the additional advantage of employing a large amount of local labor, and of turning the wheat to the best advantage, as by aid of new machinery and the best systems of milling a far greater and better yield can be obtained than by the more antiquated methods which still to a great extent prevail here. Messrs. Starr & Co. are now building an immense flour mill and wheat elevator on the south shore of the Straits of Carquinez, about two miles below Porta Costa, and fronting the town of Crockett, to carry out this plan, the spot they have chosen being available for the largest ocean steamships, while it is sufficiently sheltered for the river barges from the interior to approach it with safety.

At the site of the mill the shore curves inward, leaving a flat rock reef mostly bare at low water, but sloping off abruptly on the northern and western edges. Upon this reef there is being erected an eight story mill and elevator building, about 150 feet by 300 feet, reared upon a superstructure of artificial stone piers and arches. The piers, of which there will be 209, averaging from 5 feet to 8 feet square at the base, and standing 13 feet apart from center to center, are built upon the rock, and are connected by groined arches, standing some 4 feet clear above high water level, which has an open passage under them, between the piers. The artificial stone floor of the mill and elevator is laid over the arches and forms a monolithic platform of nearly 50,000 square feet area. There will be 140,000 cubic feet in the piers, arches, and floors, the greater part being already in position, and heavy wire cables are being laid transversely through and through the concrete above the arches to serve as earthquake ties. This portion of the work, which will cost $50,000, is being done by Mr. Ernest L. Ransome, who has long been occupied in California, bringing into extensive and successful use the artificial stone invented by his father, Mr. Frederick Ransome, a number of years ago.

The mill building will be 143 feet by 158 feet, with seven stories, aggregating 100 feet in height, while the elevator, 82 feet by 178 feet, is to be capable of storing 10,000 tons of wheat. The outside walls of the great building will be formed of heavy buttresses, rising over the artificial stone piers, and connected with curtain walls. The floors above the first story will be carried by clusters of five wooden pillars, 13 feet apart. The engines and boilers are in a separate structure, the power provided for milling purposes being 2,400 horse power, and for the elevator 300 horse power. The ultimate capacity of the mill will be 6,000 barrels of flour per day, but it will be started with machinery for turning out 2,500 barrels per day. Agents of the company are now in Europe inspecting all the best milling machinery and processes.

The docks, to be covered by two-story warehouses, are in two sections, having an open slip 104 feet in width between them. The eastern dock section will have an area of 115,000 square feet, and the western section one of 256,800 square feet, and both are to be traversed by railway lines in connection with the railroad system of the State.

From this account an idea will be gained of the extent of the enterprise which Messrs. Starr & Co. are inaugurating, and the magnitude of the trade in which they are engaged, and which they are making such great exertions to keep.

The New Time Standards.

The proposed new standards of time for the railways of the country, which are to be established by the General Time Convention of Railroad Managers, has received the approval of the Harvard Observatory, and its co-operation is promised. The railroads centering here acquiesced in the plan on the condition that the time given from the observatory should be correspondingly changed. The consent of Professor E. C. Pickering, the director of the observatory, being necessary, he was met in New York promptly on his arrival from Europe on Sunday by Mr. J. Rayner Edmonds, of the observatory, and his hearty approval of the scheme was readily given. Accordingly, a note has been sent to the Secretary of the Chicago Convention, W. F. Allen, to this effect, and assurance given that if the convention adopts the system the observatory will be ready to furnish telegraphic signals conforming to the minute and second of the proposed standards.

Under the new system, instead of running the various systems and divisions of systems by as many local standards of time, the continent is to be divided into five broad belts, running north and south, the time for each of which will be one hour slower than that of the next division to the eastward and one hour faster than that of the next division to the westward. By this plan the minute hand of a traveler's watch will not have to be changed, however far he may have to travel or in what direction; but his watch will be just one hour slow when he crosses the imaginary line into the next division to the east, or an hour fast when he crosses the line into the next division to the west. The time now furnished by the Harvard Observatory is the mean solar time for the Boston State House. The new time will be 15 minutes 44·5 seconds—practically 15¾ minutes—slower, and will be the average time for this division, which includes the New England States, New York and Pennsylvania, and the greater part of Canada. North of Lake Erie the division extends west to Detroit, while south of Lake Erie Pittsburg is practically on the western boundary of this division. Thus in the region north of the lake the standard time will be five hours slow by Greenwich, and south of Lake Erie and west of Pittsburg it will be six hours slow by Greenwich. The new standard, if adopted, will go into effect on a Sunday noon, and from that hour all the railroads will be run by the new time.

The new time standard was adopted October 11, by 78,000 miles of railway.

IMPROVED TRICYCLE.

The guide wheel standard passes through a sleeve, and has at its upper end a short right angle bar, to the end of which is a rod reaching to the crank operated by the right hand piece. The tricycle is propelled by the feet of the rider working upon jointed pitmen, whose forward ends are pivoted to the ends of a crossbar, and whose rear ends are attached to the crank of the bent axle. The body iron is U-shaped, and is formed with sets of plates by which it is

ASBURY'S IMPROVED TRICYCLE.

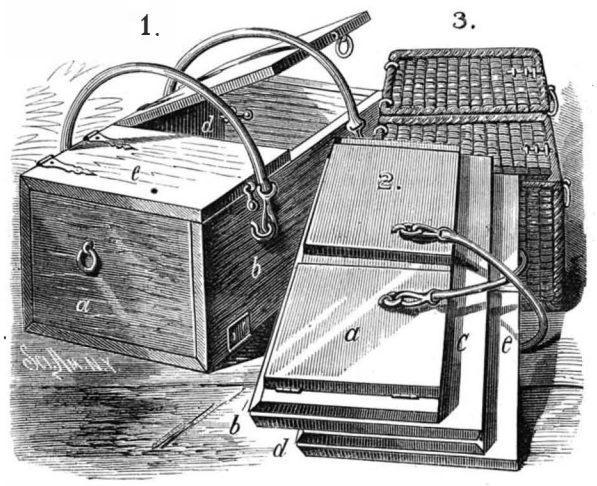
secured to the axle, the plates serving as boxes to receive the journaled blocks. To the upper ends of the body iron is secured, in a horizontal position, a second U-shaped iron, in the center of which is a third U-shaped iron vertically arranged for supporting the seat. To the forward ends of the horizontal piece are attached the hand pieces, one of which is rigid while the other may be turned, and so change the front wheel from left to right to guide the tricycle.

This invention has been patented by Mr. William Asbury, of Boston, Mass.

FOLDING BASKET.

This basket may be folded very rapidly, so as to occupy but little space, and can be erected readily for use. It may be made of either sheet metal, wood, wicker-work, or other material specially adapted for the service to which it is to be put. In the accompanying engravings, Fig. 1 represents the erected basket made of wood, Fig. 2 the same folded, and Fig. 3 shows it erected and made of wicker-work. In the first two figures like letters represent like parts. To the opposite edges of the bottom the front and back are hinged; the front being hinged so that it swings out and folds under the bottom, while the back is hinged upon the inside so that it will rest upon the bottom. The cover, which is halved, is hinged so that it folds over upon the outer surface of the back. The ends are hinged to the front side and fold down upon its inner surface.

From this it will be seen that all the parts of the basket lie flat upon each other, and take but little room. The covers are provided with hasps or loops through which hooks on the front can be passed. The sides of the ends opposite the hinges are furnished with hooks to be passed through



DAUL'S FOLDING BASKET.

eyes or rings projecting from the inner surface of the back, so as to keep these parts in place. On the inner lower edge of the ends is a sliding bolt, which enters a hole in the bottom. On the outer part of the front and back and at a short distance from the top are staples or rings, and on the two ends and under side of the cover are similar staples. When the basket is erected the handles are hooked to the back and front staples, and when folded are hooked to the end and cover staples. The basket may be made strong and light, and at small cost.

The invention has been patented by Mr. Anton Daul, of Jamaica, Long Island, N. Y.

Labor Saving Cranes.

At a recent meeting of the American Society of Civil Engineers, in this city, a paper by Mr. C. J. Appleby, on the subject of cranes as labor saving machines, was read by the author, who remarked that a well constructed crane or other similar power machine requiring only one man to drive it would do as much work as could be done by the manual power of ten men, but in one-tenth of the time they would require. It seems singular that railroad and waterside depots and workshops should so rarely be laid out with reference to the employment of such labor saving machines. The most economical working result is obtained from machines so arranged that when they take hold of the load, it is not released until final deposit. The author considered the following systems for transmitting or applying power:

1. The well known hydraulic system, with pressure pumps, accumulator, and distributing pipes.
2. Compressed air distributed through pipes.
3. Steam distributed as above.
4. High speed rope or "endless cotton cord," which runs at a speed of 5,000 to 6,000 feet per minute.
5. Low speed rope running 1,500 to 2,000 feet per minute.
6. Square shaft supported on tumbler bearings.
7. Steam from a boiler delivered on the top of a piston with multiplying chains similar to the hydraulic system.
8. Boiler and engine fixed on the crane, and driving gear for the several motions required.

The first, second, and third can only be applied to cranes fixed or moving over very limited areas. The fourth, fifth, and sixth will transmit power over large areas, which, however, should be nearly rectangular. The other two can be used generally wherever there is a railway track. The hydraulic system possesses great advantages over compressed air or steam, but experience tends to the conclusion that its common use will be attended with considerable inconvenience where the winters are cold. The use of compressed air has not been applied with great success in many cases.

Steam is largely used, and frequently carried through 1,000 feet of pipe without much inconvenience. The high speed cotton cord runs at a speed of 5,000 to 6,000 feet per minute. The cord works in grooved pulleys, is carried on rollers or other supports at intervals of ten to twenty-five feet, and is kept in tension by a weighted pulley. Low speed rope transmission is generally effected by a hemp rope running from 1,500 to 2,000 feet per minute. The square shaft has been used for many years, the only special difficulty experienced being that of supporting the long main line of driving shaft. The author exhibited recent designs whereby this difficulty has been very successfully overcome. The relative advantage of rope or shaft transmission is largely influenced by local circumstances. As a general rule the rope system costs less and is better where the distance for transmitting exceeds 200 feet. Below that distance the shaft is probably the best and cheapest. But the rope possesses advantages when machinery has to be on different levels, or at an angle with the point from which the power is transmitted.

The steam crane, employed under many differing conditions, perhaps performs more functions than any other mechanical arrangement for lifting and placing loads. All such cranes should lift and turn around by steam power. One, specially illustrated, has additional motions for altering the radius of the jib for hauling materials, so as to bring them within the reach of the machine, and also for moving empty or loaded cars. Fixed cranes are often seen so placed that one-third or even one-half of the number erected at a particular point are idle. It would, therefore, seem that for the same outlay, the best duty will be obtained from movable cranes. Where two or more railroad tracks are parallel with the water front, it will often be desirable to make the crane span the two lines of tracks, allowing head room for the vehicles to pass under it. Cranes fixed on floating vessels were also illustrated up to 60 tons power. Locomotive cranes up to 25 tons were described, and also cranes specially adapted to terminal freight stations. One of these has lifted 80 tons per hour a height of 20 to 30 feet, and deposited the loads of 1½ to 2 tons each 60 feet from the point where taken up. A similar crane commonly delivers 240 barrels of oil per hour the same height of lift and length of deposit.

The cost, per day, is one driver's wages and the necessary fuel, oil, etc. Five per cent. per annum is ample allowance for depreciation. The cost of this system of working is easily ascertained, but a great gain also arises from the increased speed of passing large quantities of merchandise.

The paper was discussed by Messrs. Cartwright, Cooper, Emery, Farney, Geo. S. Greene, Jr., Hamilton, R. L. Harris, James Platt, and the author.

A Shower of Grasshoppers.

According to a local paper, a shower of grasshoppers fell in Louisville during the evening of September 30. They made their appearance about nine o'clock, and soon scattered over the streets, filling every place to which they could gain access. Many gathered about the lights, but the cold had so benumbed them that they displayed little activity. They were of all sizes, but the large ones outnumbered the little ones. It is supposed they were blown to the city by a strong breeze which prevailed during the afternoon, but that theory will hardly account for their great numbers, for they were thicker than is generally the case on their native heath.

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Mistakes in Nursing.

A physician contributes to *Chambers's Journal* a paper on the nursing of the sick, from which we extract the most practical portion of the M.D.'s suggestions. It will be observed that the writer dwells upon the importance of avoiding over-attention on the part of the attendant in the sick room, and the importance of quietude, which he defines as the absence of all excitement, and it must be remembered, the writer further adds, that anything out of the common will tend to excite the mind of a sufferer. Do not, therefore, walk on tiptoe, for this, in addition to its unusual elaboration of the gait, invariably causes a certain amount of creaking. Speak in low tones, but don't whisper; a whisper will often awaken a sleeper who would not be disturbed by ordinary conversation; and never say "Hush!" Let your clothes and foot covering be of as noiseless and unobtrusive a character as possible, and instead of gliding and tottering about like a rickety ghost, do not hesitate to walk. If you have occasion to say anything in the room, say it so that the patient can hear it if he wishes, and do not let him be aware of your conspiring privately with the others, especially at the door.

That door has much to answer for. If it be visible from the bed, people open it cautiously, put their heads in, and slowly withdraw again. If, as is more frequently the case, it is screened by the bed curtains, mysterious openings and shuttings are heard, unattended with any ingress or egress, and *sotto voce* colloquies go on outside. When you enter, do so honestly and at once; do not spend five minutes in turning the handle, like a housebreaker, thereby producing a series of irritating little clicks, finally terminating in a big snap, with which the door flies open. If the latch be at all rusty, a handle that is slowly wound back in this way will often stick, and either require to be rattled back into position, or, if left as it is, may start back suddenly after a time of its own accord with a report like a pistol shot. It is always well to recollect that it by no means follows that a sick person is asleep because his eyes are shut; he may be acutely conscious of all that is passing in the room, though unable or unwilling to make any sign; and nothing can be more maddening, under such circumstances, than to have people hush-sh-ing, and whispering around, and creaking about on the tips of their toes. We have all sympathized in our hearts with poor Sir Leicester Dedlock when his tongue was smitten with paralysis, with his sister constantly bending over him with clasped hands and murmuring, "He is asleep!" till, goaded to desperation, he makes signs for his slate and writes, "I am not."

Never stand at the foot of the bed and look at the patient. While talking to him it is better to sit by the side of the bed, and as near the pillow as possible, so that you may converse easily, while your face and body are turned in the same direction as his. By this means, you can make all necessary observation of his features without enforcing the arrest of his eyes to your own, which is so embarrassing and disagreeable to one lying in bed, and is almost unavoidable when facing him. Keep him in as comfortable a position as possible, by all means, but don't be too demonstrative in smoothing the pillows and little offices of that sort. Fidgety attentions will worry him, and do him more harm than downright neglect.

When you are sleepy, it is better for your charge, as well as for yourself, that you should go to bed at once, and get that repose in slumber to which you *must* succumb eventually, however strong your devotion may be, and however great the interests at stake. It is not necessary to dwell here on the prudence of economizing your strength, that you may be capable of greater or prolonged exertions, should the need for them arise, or to look at this detail from the point of view which affects yourself. But in any case, you can be of little or no service, worn out with fatigue, and in a condition more akin to somnambulism than vigilance, and the spectacle of a nodding, dozing nurse is neither soothing nor reassuring to the sufferer; while, if you be one near and dear to him, he will be tormented with anxiety lest you should impair your own health on his account. In such a case as this, you cannot do better than lie down comfortably on a sofa or bed where he can watch you, and there have a good nap—for his sake.

Some people have a great notion of "tempting the appetite" by the suggestion of all manner of eatables and drinkables, or by bringing them ready prepared to the bedside experimentally. This, no doubt, is very well at times—during convalescence, for instance; but as a medical man, I am persuaded that it is a mistake in the earlier stages of an illness, when all food is loathed alike, and the creation of an appetite is an impossibility. The only thing to be done is to impress on the invalid the necessity of taking what is ordered for him at stated times, just as he takes his medicine; and it should be prepared on the same footing as a medicine—with the understanding that it is a nauseous dose, and must be presented in a form that will admit of its being swallowed as compactly and rapidly as possible. It is worse than useless to employ flavoring matters at this stage, with the idea of making anything palatable; if you can render his food absolutely tasteless, as you will do far more for him. And beyond this forcible administration, so to speak, of a certain amount, I think little good is gained by suggesting this or that delicacy, in the hope that your patient may be induced to "fancy" something. We may take it for granted that when he feels inclined for anything he will ask for it spontaneously; and the promptings of nature are more likely to lead him to a choice of what is best for him, than our string of suggestions. I have frequently observed that when sick people have mentioned a desire for any special food, they almost invariably eat of it when it is procured; whereas it often happens, when they have been persuaded to assent to something which has been proposed, the inclination—if it ever existed—has passed away before the dish or article can be brought to them.

I say, "if it ever existed;" for there is no doubt that a patient often yields to suggestions in sheer extremity, simply for the sake of peace. I happened to be in a sick room the other day, when a relative arrived on the scene. She had been warned to repress all emotion, and succeeded very well; but her tender solicitude was wholly irrepressible. I am sure that she asked at least twenty questions in less than a minute, until the unhappy sufferer writhed under them. "Shall I raise your head a little? Will you have another pillow? Wouldn't you like your head a little higher? Let me fan you. Will you have the blind up? What can I get you? Some arrowroot? Do try some! I am sure you will be more comfortable with another pillow. Will you have one?—yes; do! I'll go and get one. Will you have a cup of tea? I'm sure it would do you good. A cup of tea won't take a minute," etc. The cup of tea has been a dreadful instrument of torture in the hands of well meaning people, who would not knowingly have teased a fly.

These are small things, you will say. But a small thing in health is often magnified to a grave matter in sickness, and the sum total of them all may be as serious in their effect as the disease itself. It will be seen that the few points upon which I have laid stress are such as are calculated to promote tranquillity of mind—which, indeed, is half the battle in medical treatment. It is generally conceded that a trained nurse, who has no interest in the patient beyond that which the duties of her office impose, is better fitted to expedite his recovery than those who are bound to him by ties of affection, however welcome their presence may be in the hour of affliction. Whether the reader will agree with me or not, my experience in foreign countries has impressed me with the conviction that men make far better nurses than women.

Fish Analyses.

The only published analyses of fish which we have in this country, calculated in such form that they can be compared with one another and with other foods, are given in the volume, "Food: Some Account of its Sources, Constituents, and Uses," by Professor A. H. Church. It forms one of the series of South Kensington Museum science handbooks, and is intended as a "guide-book to the food collection" of the Science and Art department, which, some seven years ago, was removed from South Kensington to the Bethnal-green Branch Museum. The old analyses given in the Bridgewater treatise, and those of J. Pereira, one of the first Englishmen to pay attention to the chemical constituents of foods, are now of no practical use, as the compounds are expressed in combinations, which are no longer used in calculations respecting food values. The analyses given in the "Food" hand-book, the last edition of which is 1876, are only for salmon, mackerel, sole, conger eel, pike, and herring, and these it is stated are quoted "under all necessary reserve" from a former edition. Professor Church did, in 1876, incorporate one original analysis, that of the herring, and it differs considerably from that quoted from the former edition. The difference is as great as this, the calculations being made for a pound of flesh: Nitrogenous matter (old analyses), 3 ounces 317 grains; (new) 2 ounces 70 grains; oil or fat (old), 1 ounce 56 grains; (new) 2 ounces. In the more recently published "Nahurugs-und Genuss-mittal," by Professor Koenig, there are several analyses given, but, with the exception of an old analysis by Frank Buckland, they are all from Continental laboratories, and therefore presumably made from examination of Continental specimens of fish; and as fish vary so much in different localities, it is by no means certain that they may be safely taken as representing fish that comes to the British market.

The great difficulty that lies in the way of making use of practical calculations of any of the published analyses is that no statements are given as to the time of year at which the analyses were made, nor of the condition of the fish. It is well known that fish vary much in their composition, especially in the amount of fat they contain, at different times of the year. There is also a difference of fish even of the same species caught off different parts of our coast, as, for example, a Dover sole is "instinctively" recognized as different from a Torbay sole, though we are without analysis to tell us what the difference is as regards chemical composition. Every one must have remarked the great difference there is in the richness of herrings, both in regard to season and the place they come from. There is this further drawback to relying on published fish analyses for practical purposes, that it is not stated whether they are the average of many analyses or are single experiments.

As a matter of fact, fish analyses have not been wanted for any practical purposes till now. The public dietaries for our soldiers and sailors, our pensioners, our reformatory boys, our paupers, and our criminals, have never included fish even in localities where fish is plentiful. There have been many returns at different dates to the House of Commons on workhouse dietaries, but they may be searched in vain for any mention of fish. As regards soldiers' diet, it is true that several hundred portions of fried fish, principally plaice and haddock, are sent daily to the barracks of our Guards in London at tea time, and the men are allowed to purchase of the privileged dealer what they care to pay for, but it does not form any part of their regulation diet. This year an attempt has been made to introduce fish into workhouse dietaries, but the first attempt at Canterbury was a signal failure, the inmates asking that they might be allowed to have their former diet. In one or two other workhouses since then, where double the quantity of fish has been substituted for meat, it has been received with less disfavor. Unfortunately, the only information given in any of these cases is the vague statement, "Fish was substituted for meat." With regard to "meat," most of the returns very clearly stated not only which are "beef days" and which are "mutton days," but what are the joints used. It is well known, chiefly from the many years' experiments at Rothampstead, not only what is the nutriment value of cattle and sheep of different breeds and in different conditions, but the value of different parts of the animals is known. The vague term "fish" conveys no information as to nutriment value at all. Allowing for all imperfections in the exactness and fullness of our knowledge of fish, the English and the Continental analyses show unmistakably that some *genera* have far higher food values than others. For example, the nitrogenous, or flesh forming compounds, differ as follows (according to the hand-book), the calculations being per pound of flesh: Mackerel, 3 ounces 387 grains; conger eel, 3 ounces 233 grains; pike, 3 ounces 23 grains; salmon, 2 ounces 48 grains; sole, 1 ounce 350 grains; herring, 1 ounce 270 grains. Thus the flesh forming compounds in mackerel may be reckoned at double the quantity present in herring, even if the newer analysis of 2 ounces 70 grains be taken. The amount of fats, or heat and force producers, is quite a secondary consideration, because they can be had from flour and rice and many vegetables, and the fat with which fish are cooked, but none of which contain more than very small quantities of flesh formers. It is hardly to be expected that salmon and soles should be introduced into public dietaries, but mackerel and herrings are often cheap enough. The importance of knowing the composition of the flesh of fish is at least illustrated by the comparison of these two. If the rations are served by weight, then there would be double the amount of flesh forming material served out when mackerel is used than when herring is used; if they are served on a chemical basis—in many dietaries they are—then twice the weight of herring must be served to what must be given when mackerel is used. For comparison, the flesh forming compounds in beef may be taken at about 3 ounces, that is of the parts that can be eaten and digested, and mutton rather less.

The question of cost of course largely enters into calculations in public dietaries; even supposing the flesh forming constituents of fish are given at the highest amount when in best condition, it is evident they are not less than that of meat, while the cost is far less. Of the cheaper fish, such as plaice, haddock, whiting, there do not seem to be any analyses at all, and, therefore, the introduction of these into dietaries would be an uncertain step at present.—*Journal of Society of Arts.*

Wasp Stings.

This being the season at which petty questions and grievances are most likely to be relieved or redressed by the publicity offered by the press, a considerable number of correspondents are expressing the burning interest they take in the treatment of "wasp stings." There can be no doubt that under certain conditions the sting of a wasp may prove very injurious, or even dangerous to life. We are unable to indorse the opinion that there is no danger unless there be fear. It is quite possible that the sting of any insect capable of generating a poison may be fatal without the intervention of panic. The nervous system is in some of its states exceedingly susceptible of sudden impressions, which, as it were, "stagger" the nerve centers by shock. The bites of small snakes probably act in this way, and the sting of a wasp may prove fatal in the same fashion. As to remedies, ammonia is, of course, the obvious recourse; but almost anything "strong," in a popular sense, will generally suffice to decompose and destroy an organic poison if instantly applied. This is why the juice of an onion answers the purpose. Anything equally pungent would do as well.—*Lancet.*

Home the Best Place for Invalids.

The New York *Sun* compiles from the *Continent* the opinions of a physician about the curative powers of nature. The physician concludes that it is better for a consumptive to stay at home, where he can be comfortable, than subject himself to the discomfort of hotel life, or to the greater inconvenience of a camp. He says that the camp cure may be fairly tried by sleeping on one's own house top. Another medical man replies that the summer conditions of spruce forests are eminently favorable, and consumptives have recovered in the most surprising way living under canvas in them, where the air is impregnated with the healing emanations peculiar to the non-deciduous tree growths. There are consumptives whose lungs crave the salt air of the ocean; others to whom the dry atmosphere of Colorado is infinitely soothing; and others again who are benefited by the climate of Florida or Southern California. "To prescribe Florida for one person might mean death, while if he went among the northern paradise of spruce, recovery might follow."

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ENGINEERING INVENTIONS.

Messrs. John A. Lesourd and James Lotan, of Portland, Oregon, have patented an improvement in hydraulic elevators of the telescopic kind, in which a fluid under pressure, or which is supplied from a higher head or level than that to which it is necessary to raise the cage or platform of the elevator, is made to act upon a series of rams or tubes arranged to work one within the other. The invention, however, differs from other telescopic hydraulic elevators in its mode of action, valve gear, and mechanism, whereby are produced what the inventors term a "multiple hydraulic elevator," in which each telescoping section is controlled by independent valves, and may be raised or lowered independently of the other sections, thus making each section a complete elevating device within itself, and so that the working fluid may be introduced to either telescoping section to operate the platform of the elevator a given distance, or all of the telescopic sections may be simultaneously operated, as desired.

MECHANICAL INVENTIONS.

Mr. William Cowles, of Newburg, N. Y., has obtained a patent for an improved machine for rapidly and thoroughly cleansing and washing bottles, and rinsing them out before they are removed from the machine.

Messrs. Lewis Emery and Frank B. Stebbins, of Galion, Ohio, have patented a cutter head for producing raised panels from integral portions of the same with mouldings, and to round or bevel the edges of the panels to fit the grooves of the stiles of the door or other frame at the same time. This improvement claims to obviate all necessity for hand work.

A millstone dressing machine has been patented by Mr. Thomas C. Barnes, of Logansport, Ind. The invention relates to the dressing of millstones by means of a diamond cutter, and provides means for the adjustment of the cutter at any required angle, its feed at any proper speed, and its entire control in either direction by the operator. The entire arrangement may be made automatic at will.

Among the recent patents issued is one for an improved and simple steam whistle granted to Mr. J. E. Gause, of Brownsville, Tenn. In combination with the bell of a steam whistle a movable valve is fitted for operation by the engineer, so that the tone of the whistle can be changed readily at the will of the engineer. Means are also provided for adjusting the bell to the steam outlet so as to obtain a clear tone.

Mr. Arthur Grundy, of New York city, is the patentee of an improved freight car which can be loaded very rapidly and easily with large and bulky material. A section of the top of the car is readily removed to admit of the loading of hay, cotton, or any other material upon the platform, when the top can be restored to its place again without much trouble.

Mr. Louis Baumann, of Offenburg, Germany, has obtained a United States patent for a rag cutting machine by which a great saving in the power is claimed and a superior result is obtained. A reciprocating knife is connected to the frame by a pivoted link which gives an oscillating reciprocating movement to the knife, giving the latter a drawing cut.

A new universal joint has been patented by Mr. George Carlisle, of Attleboro, Mass., consisting of a U-shaped projection from a rigid collar on the end of each shaft, or spindle, connected by a link or ring, the U-shaped staples having each a projection in line with its shaft, beveled or coned to correspond to the angle at which the shafts are to be run in relation to each other. These projections serve to keep the ends of the shaft apart and prevent noise in operation.

Messrs. T. R. Ellerbeck and A. C. Young, of Salt Lake City, Utah, have recently secured letters patent for an improved hose and rope reel containing a spring which is coiled by the unwinding of the rope or hose, which spring winds up the hose or rope as soon as it is released. To prevent overwinding of this spring or unwinding it too far, a drum is arranged to travel on its axis and strike against checks, after making sufficient revolutions to tighten the spring as much as may be necessary.

Mr. George B. French, of New York city, has patented two methods of coloring the outside of finished cigars; one that of carrying the cigars on an endless apron under another apron containing coloring material, the arrangement of the apron being such that the tips as well as the body of the cigars are evenly colored. The other method colors the cigars by means of brushes, and a soft felt material in an annular channel outside a horizontal revolving plate.

An improved fire extinguisher has recently been patented, so constructed as not to be charged and put under pressure except at the moment that it is required for use, and this can be accomplished in a few seconds and without previous knowledge. This extinguisher is filled with water in which has been dissolved an alkaline powder. By a rod at the top of the extinguisher is held suspended a sealed bottle containing a preparation which will disengage carbonic acid. In case it becomes necessary from fire to charge the apparatus, by turning a handle at the top of the extinguisher the bottle will be dropped and its contents discharged into the alkaline solution; the gas being at same time disengaged and a pressure established. The inventor of this device is Pierre C. E. Tabouet, of Paris, France.

AGRICULTURAL INVENTIONS.

Mr. James A. Ehle, of St. Cloud, Wis., has invented an improved hay tedder. The invention consists in connected mechanism by which the forks will be vibrated by the advance of the machine, and the forks will be made to pass forward over the hay when a windrow is formed. The driver can readily dump the gathered hay or can raise the rake to avoid an obstruction.

A corn planter has recently been patented by Mr. Thomas A. Rasmuson, of Forest City, Iowa, the object of which is not only to facilitate the accurate planting of corn and other seeds in hills, but to produce a convenient and easily controlled mechanical planter. The amount of seed dropped, the spaces at which they should be dropped, and the intervals, if any, are entirely under the control of the driver of the machine.

Mr. Peter Rodenbour, of Quincy, Ill., has invented a corn planter intended for planting corn or other easily deposited seed in hills, at equal distances apart, and adapted to any convenient or desired distances. The machine is adjustable to the amount of seed or the size of grains to be used, as well as to the distances.

Mr. Elijah Hickman, of Red Bluff, Cal., has patented an improved grain heading machine, the cutter or sickle bar of which may be adjusted at will to the varying height of the heads of the grain, independent of the general movement of the machine over the surface of the ground. The improvement combines a means of forcing the heads of the grain against the sickle blade, and the center of gravity is brought nearer the center of the machine than in ordinary headers.

An improved panel fence has been recently patented by Mr. James W. Rigg, of Mount Carmel Precinct, Ill., which has no permanent security to the ground but a pin used to secure a diagonal brace, but which may readily be withdrawn and redriven with very slight exertion. The panels are of light construction, can be easily handled, are self-interlocking, and their posts rest on surface blocks, so that the fence can be easily taken up, be reset, and moved from place to place.

Mr. W. C. Henderson, of Sulphur Springs, Texas, has patented a sulky plow constructed with the sliding block carrying the adjustable wheel locked in place by a sliding spring-pressed bolt and withdrawn by means of an elbow lever. The sliding wheel carrying block is provided with rack teeth engaging with the teeth of a double gear wheel placed loosely upon the journal of the plow crank, and connected with the plow crank lever by a pawl, whereby the machine can be leveled and the plow adjusted by means of the same lever.

MISCELLANEOUS INVENTIONS.

Mr. H. S. Lockwood, of South Norwalk, Conn., has recently patented a very simple toy pistol, which he claims is perfectly safe and harmless, the explosion of the paper cap taking place in front of a plate or cut.

A convenient salt box for table use, with a shaft having stirring arms or a screw propeller disk, for loosening the salt, has been patented by Mr. Robert E. Caine, of Battle Creek, Mich. The same contrivance for keeping the contents of a salt box from caking may also be used for ginger, pepper, or other spices.

Mr. John Zerr, of Keokuk, Iowa, has patented a fire escape in which scaling ladders are secured to the building, and belts are raised by means of ropes passing over pulleys at the upper ends of the uppermost ladders, by means of which the rope or belt or basket can be secured for lowering persons.

Mr. Wiley D. Coffey, of Pangburn, Ark., has obtained a patent on a horseshoeing rest for holding the feet of horses, mules, or other animals while undergoing the operation of shoeing, whereby the work is facilitated, the shoer relieved of supporting the weight of the animal's limb, and much danger to the blacksmith is avoided.

An electrical fire alarm for hotels and other buildings has recently been patented by Mr. F. A. Copeland, of La Crosse, Wis. A composition is used which melts at about 150 degrees Fahrenheit, and allows a weighted sleeve to swing around against a button on the wall, closing the circuit, and rings a bell in the office.

Mr. J. B. Jonis, of Olympia, Wash. Ter., has recently patented an improved toggle for boom chains which should recommend itself to lumbermen generally. It consists of a boom chain toggle formed of a metallic bar having a median eye projecting down from its under side, and fits into a hole in the boom stick, the bar being provided with right angle points which stick in the log.

Mr. C. W. Vetter, of Ukiah, Cal., has recently patented an improved fruit drier which consists of a stove provided with a heating chamber adapted to receive the fruit holding drawers, which consist of a frame holding a perforated metal plate, and provided with two hinged covers of perforated metal plates or wire netting, whereby fruits can be held between both surfaces of the perforated plate and the hinged covers.

A mechanical puzzle is the subject of a patent by Mr. William J. Decker, of New York city, who has contrived a board or block grooved to receive sliding blocks, each bearing a distinctive number, letter, or character of a symbolic nature, the movements of which by means of a single switch that guides into all the grooves, lateral and transverse, may be made to form legible combinations.

A simple and effective safety attachment for dampers has been patented by Mr. J. M. Dolen, of Wiconisco, Pa. The object of this invention is to provide for closing dampers of stove pipes automatically when the heat becomes excessive. A friction device is provided, so arranged as to hold the damper open, and made fusible, so as to give way when the pipe becomes highly heated, permitting the damper to close by its own weight.

A non-freezing hydrant is the subject of a patent obtained by Messrs. William Vadersen and Frank L. Trader, of Elizabeth, N. J. The invention consists in a packed upper section of a street hydrant, and a valved lower section by which the water in the upper section may be allowed to run off to prevent freezing in severely cold weather, and by which, also, water can be readily drawn from the main or service pipe in any weather.

A method of making buildings fireproof, or non destructible, in all their parts, has been patented by Mr. William H. Dolman, of St. Helen, Oregon. He proposes to sheath all the ceilings of wooden buildings with sheet iron, and fill the interstices of stringers and floorings with fine ashes or dry earth, or other non-combustible material--in short, to make the present hollow walls and ceilings solid, or at least non-combustible, and to destroy the draughts that make inviting chimneys to sidings and partitions.

An improved two wheel vehicle, so arranged that the body of the vehicle will always maintain a level position without reference to the position or amount of the load, has been patented by Mr. Benjamin S. Porter, of Red Oak, Iowa. The invention also consists in the use of horizontally arranged Y-shaped springs, the upper and lower members of which are attached, respectively, to the body and axle of the vehicle, the trunks of the springs being attached to the thills or to a front cross bar of the vehicle.

Messrs. James Smith and David E. Blake, of St. Louis, Mo., have patented a plan for a refrigerator by which they claim to effect a great saving in the consumption of ice and insure a constant circulation of the air in the safe by its refrigeration after having taken up heat in the cooling of the contained provisions. A peculiarity in this refrigerator is the existence of dampers or doors, by which the amount of cold air and its circulation can be governed from the outside.

An apparatus for the manufacture of glycerine is the subject of a patent recently granted to Mr. Otto Laist, of Cincinnati, O. The invention relates to the method of refining glycerine, whereby the glycerine is rendered inodorous and colorless. The improved process consists in the employment of a jet of superheated steam introduced into a glycerine retort or still to facilitate the distillation of the glycerine, which, without the aid of the steam, condenses quickly from the volatile state. A previous patent of Mr. Laist covers a good many features embraced in the new patent; the latter covers, however, certain improvements in the distilling process not heretofore achieved.

An improved hydraulic motor for vessels has recently been patented by Mr. Simon O'Brien, of Bristol, R. I. The invention consists in a motor formed of a series of pipes and a cock so connected that water can be drawn in at the bottom of the vessel and forced out at the rear end of it, to the effect that the vessel will be moved forward. Water also can be drawn in at the rear end of the vessel and forced out at the bottom toward the front end, thus moving the vessel backward. The invention also consists in attaching a hose or flexible pipe to the end of the pipe projecting from the stern, and attaching the hose to the rudder, whereby the water issuing from the hose will assist in steering the vessel.

NEW BOOKS AND PUBLICATIONS.

KING'S HANDBOOK OF BOSTON; 360 pages profusely illustrated. Moses King, Cambridge, Mass., publisher.

To one who knew the Boston of twenty, thirty, forty years ago, this *resume* of his recollections will be pleasing, for the "hand book" is also a history, and recalls the events of the last fifty years. To those who desire to visit Boston this volume will be a convenient guide. It is very handsomely bound and is finely printed, and is of a convenient size for handling and carrying.

DIO LEWIS' MONTHLY.

The second number of Mr. Lewis' new magazine is before us, and its contents are varied and interesting. The editor has a wide reputation as a hygienic writer, and he is the author of a number of works on the health and treatment of young persons—how best to promote their welfare and prolong their lives. The two numbers of Mr. Lewis' new magazine indicate that a large portion of its contents will be composed of articles on how to live, how to dress, how to exercise, and kindred subjects in which the public are thoroughly interested. The September number contains in the hygienic department, articles on ventilation, use of corsets, consumption and directions for building sun bath room and the benefits the consumptive and dyspeptic may derive therefrom. Frank Leaman, publisher, 68 and 69 Bible House, New York city.

DIE ELECTRISCHE EISENBAHN BEZUGLICH IHRES BAUES UND BETRIEBES. Von J. Kramer. Wien, Pesth, Leipzig: A. Hartleben's Verlag.

This small manual forms the 17th volume of the valuable series of electrical papers in Hartleben's library of electric technology, and supports the reputation already won by this useful publication. The chapters embrace the following topics: General remarks on railroad construction; determination of the factors employed in mapping; the foundation, the roadway, and superstructure; recapitulation of some principles in induced electricity and magnetism; magneto-electrical and dynamo electrical machines; motors, and the use of their power; the general arrangement of an electrical railway; steam engines, steam boilers, and their relations to the electrical machines; the use of electricity and its application to propulsion; the cars and their arrangement. In the growing interest felt in this new branch of electrical science, this guide must prove desirable and must meet with a profitable reception.

DIE ELECTRISCHEN EINRICHTUNGEN DER EISENBAHN UND DAS SIGNALWESEN. Von L. Kohlfurst, Wien, Pesth, Leipzig: A. Hartleben's Verlag.

This interesting and useful book forms the 12th volume of the above mentioned series, and is replete with information upon the intricate questions of railway signs, signals, and systems for prevention of accidents. The subjects serially discussed are: Introduction of electricity in railway methods; principles of its application; the carrier; sources of electricity; the transmitter and receiver; other apparatus; the electric telegraph; intermediate telegraph; telegraph connection from the railway train; railway signals; line signals; danger signals; distance signals; train signals; switch signals; control apparatus; brakes; unusual railway electric systems.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Friction Clutch Pulleys. D. Frisbie & Co., Phila. Pa.

Dies, Patterns, etc., Chas. A. Bailey, Middletown, Ct.

Patent to let on royalty, or partner wanted to manufacture it. See cut page 248. Ed. Sauter, Hartford, Conn.

Pattern Letters (metallic) to put on patterns of castings. H. W. Knight, Seneca Falls, N. Y.

Steam Pipe and Boiler Covering, Roofing Paints, Prepared Roofing, and general line of Asbestos materials. Phil Carey & Co., 127 Central Avenue, Cincinnati, O.

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Best Popular Science Works, 15 cents each. Catalogue free. J. Fitzgerald, 20 Lafayette Place, New York.

Curtis' Expansion Trap. See illustration on p. 118.

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Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 268.

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C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 221.

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Steam Pumps. See adv. Smith, Vaile & Co., p. 237.

Spy Glasses, Telescopes, Opera Glasses, Field Glasses. Send for catalogue. Queen & Co., Philadelphia.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) C. L. P. asks how to lacquer polished brass at home? If it can be heated on common oven, and about how hot? What to apply and how to apply it and how to prepare it? How hot the article should be, and how long it should be left before using after lacquering? A. The brass must be perfectly clean; it must be boiled in caustic lye if necessary. Many lacquers are used; half a pound of red lac dissolved in half a pint of alcohol is a good one. Put the article on the top of a stove until moderately heated and then varnish it, keeping it hot. Then dry it by heat.

(2) L. M. asks how to clean and polish cows' horns. A. Rasp the horn with a file to bring it to a smooth, even surface, then scrape with glass in the same manner as a shoemaker scrapes the soles of boots. This if carefully done will leave a fine, clean surface. Then rub with a piece of cloth and electro-silicon wet to a paste with water. Then polish with a cloth and oxide of tin wet with water to a paste. Sometimes the horn is rubbed down for a final polish with French polish instead of the oxide of tin. Whiting and chalk in water is also used.

(3) C. & Sons write: We are running a 5 horse power engine and using only about one-half horse power ordinarily. Would it be practicable to have an air compressor and reservoir, so as not to run our engine every day? If so, please state the most economical kind of air compressing engine and reservoir. A. It is practicable, but we do not think it would "pay;" it would be more advantageous, if you make a change, to substitute a good caloric engine and sell your present engine and boiler, unless you have use for steam for other purposes than power.

(4) A. A. J. writes: If a tubular boiler be set with side walls kept clear away from the shell, say 6 inches, and arched over the top so as to leave a jacket space all round the boiler, allowing the heat to rise from the furnace to the top, and the back end closed above the back arch, so that the draught will be directed properly to the flues, will the heat above the water line be too intense? Will it be injurious to the shell? Is it better to close in at the sides as is usually done? A. It is better and safer to close in at the sides say two or three inches below water line.

(5) F. A. C. asks: 1. Would three-eighths of an inch be thick enough for a 4x6 engine, that is, thickness of cylinder? A. Yes. 2. What size ports should I have for a 4x6 engine with double slide valve? A. Steam $\frac{5}{16}$ inch by 3 inch, exhaust $\frac{3}{4}$ inch by 3 inches. 3. Is there a patent on the double slide valve engine? A. No. 4. What will be the power of a double slide valve engine 4x6 with 100 pounds of steam and 300 revolutions per minute? A. About 5 horse power.

(6) S. M. H. asks: Could a small boiler, say one horse power, be fed from a reservoir of sufficient elevation so that the hydraulic pressure from the reservoir would overbalance the steam pressure required from the boiler? If so, what height would the reservoir have to be to insure 100 pounds steam pressure? A. The hydraulic pressure must not only be equal to the pressure, but enough more to overcome the friction in pipes and the resistance of the check valve. About 240 feet.

(7) W. J. W. writes: A locomotive with a six foot driver and a 22 inch cylinder, and a locomotive with same cylinder and "5 foot 8" driver—how much more space would the six foot driver cover than the "5 foot 8," both going at their full capacity? A. Assuming that the boiler was the same in both cases, and just sufficient, the 6 foot driver should cover a trifle more space; but if the boiler was of ample capacity, the space covered would be directly as the diameter of the wheels; this is supposing the same number of revolutions made in each case.

(8) H. W. P. writes: I am using in my business a good deal of tea lead, which I buy from junk men; and my object in now writing to you, is to ask if you can give a good recipe for melting and separating the paper from the tea lead. A. To separate the tea lead from the paper, condense the mass of lead in an iron kettle. Put a layer of powdered charcoal over the surface of the lead and cover the kettle as nearly air tight as possible. Place the kettle over a strong fire and allow it to remain until the paper is carbonized and the lead is melted, then stir the mass with a dry stick and the lead will go to the bottom.

(9) H. J. B. writes: I am desirous of obtaining a license to run stationary engines. Can you inform me to whom I must apply in order to be examined for the same? Would the inspector that examines steamboat engineers be the proper one to apply to? A. For your license apply to the inspector who examines steamboat engineers.

(10) W. D. P. asks: Does the size of wheel of a vehicle vary the amount of power required to start a vehicle? If so, please state how. A. It is generally conceded that the larger the wheels the easier the running for vehicles within certain limits as to weight and smoothness of track. As a general practice, large wheels for rough roads are considered the best, as they give a longer tread or bearing.

(11) T. H. B. asks (1) if it were possible to run a train of cars through a vacuum, and to let drop a stone or feather from a window while the train was in motion, would the object reach the ground directly under the place where the window was when it was let fall, or would it be carried forward with equal velocity as train? A. The object would receive an impulse from the motion of the train which would carry it forward with velocity equal to the velocity of the train, while the action of gravity would give it simultaneously a downward motion. Therefore, when it reaches the ground, it will be directly under the window from which it was projected. 2. Is there any more or less water on the earth and in the surrounding atmosphere at the present time than there ever was? What is evaporation? Is it possible to totally destroy water? A. The quantity of water has not changed within a reasonable geological period. In the early geological ages there was more water in the atmosphere as clouds than now, and of course less upon the earth. Evaporation is the absorption of water by the air or atmosphere. Water can be destroyed by converting it into its primary elements, hydrogen and oxygen.

(12) W. W. A. writes: Please give formula for a dry paste for cleaning gold, silver, and jewelry without scouring. A. Polish with whiting and ammonia. It is risky to use any silver soaps or cleaning pastes, as they may contain mercury, which injures the silver permanently. Try a quarter of a pound of jeweler's rouge, three-quarters of a pound precipitated chalk.

(13) J. J. B. asks how to put a surface on soft sponge leather. A. Mastic varnish, rubber varnish, wax, size or glue, and calendering, or polishing with burnishers, are all used for smoothing soft leathers.

(14) S. H. B. asks: What is the difference between "quarter" and "bastard" sawed lumber? A. Bastard sawed lumber has the annual rings parallel with the surface in some part of the board or plank, and is the ordinary method of sawing. Quartering is sawing the log into 4 parts across the center, and then sawing the quarters so that the annual rings will run out to the surface. It is not economical for the lumber producer. Quartered lumber may be made from bastard by culling and sawing out the bastard centers.

(15) W. O. S. writes: I wish to cut with a 20 thread V tap, Brown and Sharp gauge, a cog wheel, that shall have 100 cogs on the circumference. What must be the circumference of the wheel before cutting the cogs? A. The diameter of the pitch line should be $1\frac{\text{ooo}}{1000}$ inch diameter, to which add five one-hundredths inch for the outside or diameter of the blank. This will represent a proper wheel gear of 100 threads with a pitch of one-twentieth inch. As your tap will not commence cutting upon the pitch line, you will have to use the pitch line diameter for the diameter of the blank. In fact, it is a very difficult mechanical problem to make a tap match the teeth in cutting a wheel.

(16) O. A. G. writes: Will you please inform me what acids or mixtures I should use to give copper a red or variegated appearance, such as is sometimes seen on the ingots of the metal? I want it for ornamental purposes. A. The colors you see on copper ingots are due to oxidation of the metal by the air while the metal is hot. Try heating and evaporating drops of nitric acid on its surface and then heating.

(17) L. W. C. asks: Can you tell me what preparation to use in covering the floor of a photographic dark room that will fill the cracks and render it water tight to prevent the slops from going through and staining the ceiling below? A. Nail a narrow strip of wood around the corners of floor and put down a single sheet of oil cloth that exactly covers the floor. The strips are intended to bend up the edges of the oil cloth to prevent escape of liquid.

(18) E. D. C. writes: I have three presses run by a small engine which I consider good for four horse power under 45 pounds pressure. I do not consider it economical to use steam, and have been trying to secure power from a mill about twelve rods distant, which is run by water. The location is such that shafting on wire cable is not practicable. It has occurred to me that I might lay a pipe, connect it with the boiler, and use compressed air. Would such a plan be feasible? Would the apparatus be reliable? Can compressors be purchased in market? What size pipe would be needed? A. The use of compressed air would, we think, not prove economical or satisfactory. Cannot you bring the water to your place in a pipe and by it run a small turbine? If so, this will be the best arrangement.

(19) D. S. C. asks: What gives the lamp shades used on drop lights the light or white color? Are they glass or porcelain? If glass, what gives the glass the opaque or white color? Is it the peculiar kind of sand used? A. The lamp shades you refer to are of glass; glass is rendered opaque by various ingredients—oxide of tin will produce this effect.

(20) T. J. asks: What is the process of making fine shot of lead and copper? A. By pouring the metal when melted through a strainer of perforated iron, allowing the metal to drop into water at a considerable height. Shot for ammunition is poured in shot towers and falls from 40 to 60 feet. The new way is to drive cold air up the shaft, which cools the shot with a short fall of 20 to 30 feet.

(21) H. E. B. writes, inquiring about the economy of using a side wheel steamer as compared with a screw propeller. I claim that the fastest time that has ever been made on rough and smooth water has been made with a screw propeller, and it did not take any more coal to propel it than a side wheel steamer. The other party claimed that a side wheel steamer made the fastest time on smooth water and used less coal. A. For large boat of light draught, side wheel boats have made the best speed with greatest economy. For small steamers, yachts, etc., the screw has given the greatest speed, but with an enormous power and large consumption of fuel.

(22) H. C. S. writes: Please let me know if there is anything I can wash an iron mould with to help make the iron come out smooth, as the mould is small and the iron chills before the mould fills up; or is there anything I can put in the iron to make it thinner, so the iron will run more freely? A. The iron used in casting the celebrated Berlin ware, consisting of ornaments, charms, chains, and other jewelry, is said to be alloyed with arsenic, but as arsenic is very volatile and dangerous to manage except by chemists, we do not recommend its use. Tin will make the iron more fluid. Use No. 1 iron in a crucible and add when melted 2 to 5 per cent of tin. Use powdered charcoal to keep the iron from decarbonizing. Smoke the iron moulds and heat to about the temperature of melted lead. This may make the casting comparatively smooth, but will not prevent entirely the chilling of the iron. Casting in an iron mould has never been considered very feasible except for chill purposes. Finer surfaces can be had from sand moulds.

(23) F. M. L. writes: Can the business of carpentering, etc., be learned without a practical instructor? If so, what books are necessary for a beginner—the most comprehensive and practical? What will a set of drawing tools cost that are not fine, yet will answer all purposes? A. By studying "Appleton's Cyclopedia of Drawing" you will be able to learn architectural drawing without a teacher. Do not buy cheap drawing tools; better get along with a few and have them good.

(24) C. G. H. writes: Can you kindly inform me of the formula for finding the horse power both nominal and actual of the ordinary locomotive and return flue boiler? In both cases hard wood is the fuel used, and there is a natural draught through a smoke stack 60 feet high. A. To obtain the nominal horse power of a locomotive boiler: Take the whole surface of the inside of the fire box and two-thirds of the internal surface of the tubes in square feet, add them, and divide by 14,14 being considered the amount of effective surface equivalent to one horse power. The same also for cylindrical tubular and flue boilers with the fire under the shell and returning through the flues or tubes. The whole surface of the under half of shell and two-thirds of tube or flue surface as above. For the actual horse power: The quantity of water evaporated in dry steam per hour indicates one horse power per cubic foot.

(25) E. H. A. writes: I read in one of the scientific papers about an oil for lubricating made with lead and olive oil; now I want to know if cotton seed oil could not be used, and how long should it stand; and if it becomes too thick, what should be used to thin it? A. Cotton seed oil will answer. If it becomes too thick, thin it with kerosene oil.

(26) J. G. L. writes: 1. Would you please let me know how telephone wire is made, and what it is made of? A. Any iron or copper wire, or copper coated iron wire will answer for a telephone wire. The larger the better. No. 12 galvanized iron wire is the standard conductor for telephones. 2. Is any wire of iron or steel with a thick coat of copper used for telephone for electricity, and how then is that thick coat put on? A. The copper coating you mention is deposited on the wire by the galvanic process.

(27) W. G. A. writes: 1. In the telephone described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 142, do the binding screws, *a*, project through the flange, E, and connect with the diaphragm in any way? A. The binding posts are not connected with the diaphragm, but with the terminals of the bobbin. 2. How much wire should be wound around the spool, D? A. No fixed amount. Fill the spool with No. 36.

(23) T. McK. writes: Please give me the temperature of the water in a boiler when there is 25 lb. steam pressure; also give me the temperature of the water at 75 lb.? A. Twenty-five lb. pressure above atmosphere, 2,665°; and 75 lb., 320°.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

G. H. T.—It is principally silica. It might be of some value in the manufacture of fire clay articles. It may be called silicious clay.—W. W.—It is doubtful if it is of any value. Mineral paints are not rare and are low priced.—H. W.—The clay is of very good quality and might be used as fire or potter's clay in the manufacture of common chinaware.—J. W. V.—Probably of little or no value. Analysis of the three, $15 00 for iron only.—E. S. B.—The names of the specimens you sent are as follows: 7. Galenite and pyrite. 8. Pyrite. 9. Galenite. 10. Mispickel. 11. Pyrite.—W. L. B.—No. 1. Iron pyrites. No. 2, ditto in clay nodule. Probably of little value.—D. A. R.—The sample is infusorial earth, composed principally of silica. It is of little use except as a polishing powder or as fuller's earth.

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October 9, 1883.

AND EACH BEARING THAT DATE.

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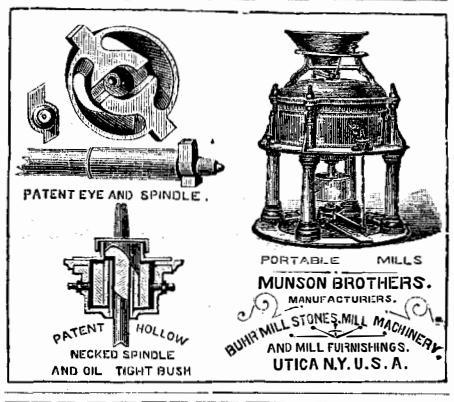
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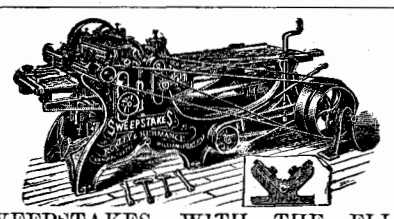

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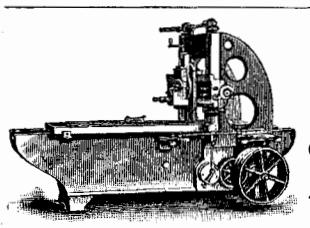

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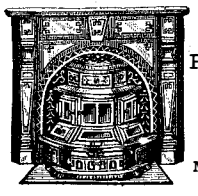
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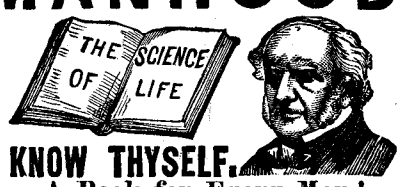

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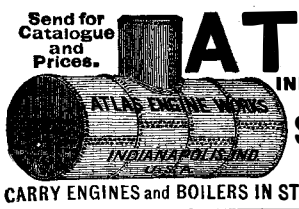

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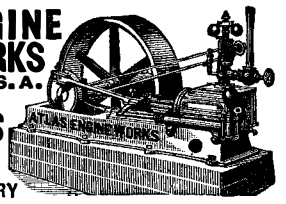
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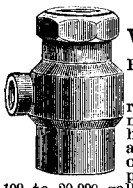
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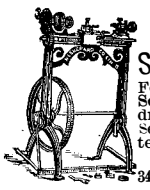
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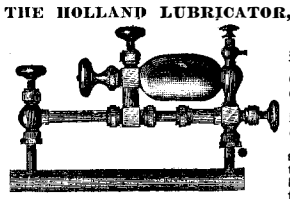
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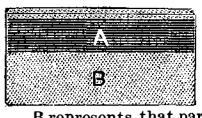

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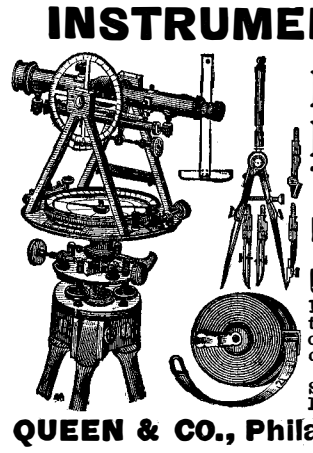
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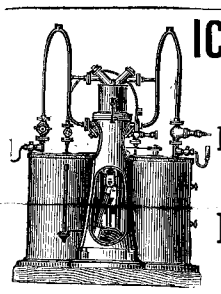
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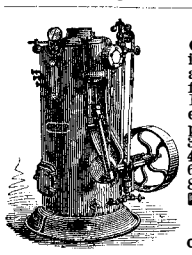
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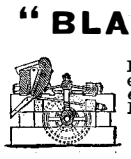
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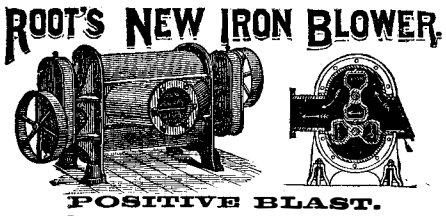
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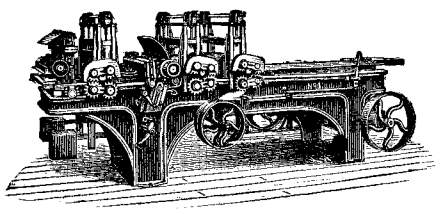
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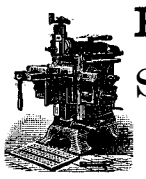
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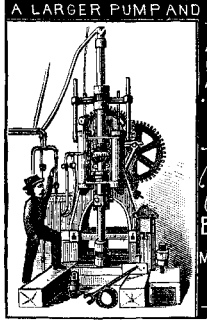

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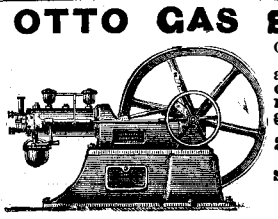

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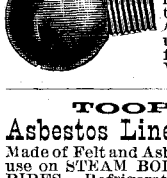

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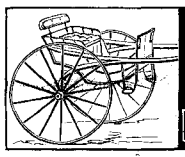

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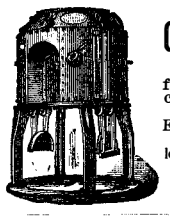

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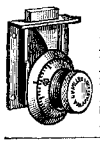

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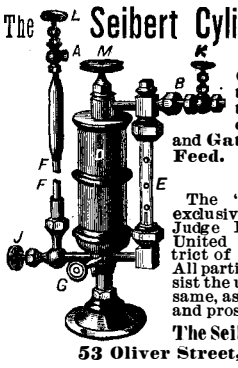

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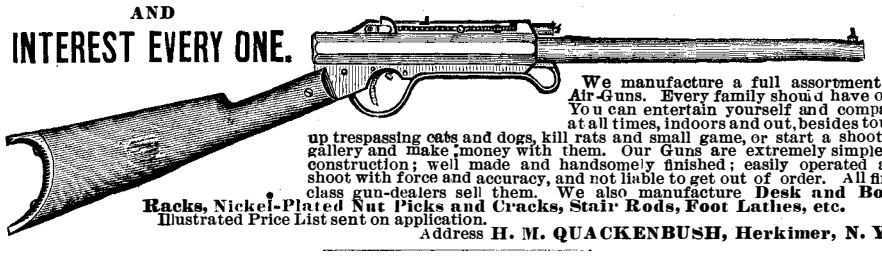

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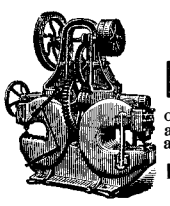

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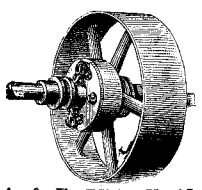

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